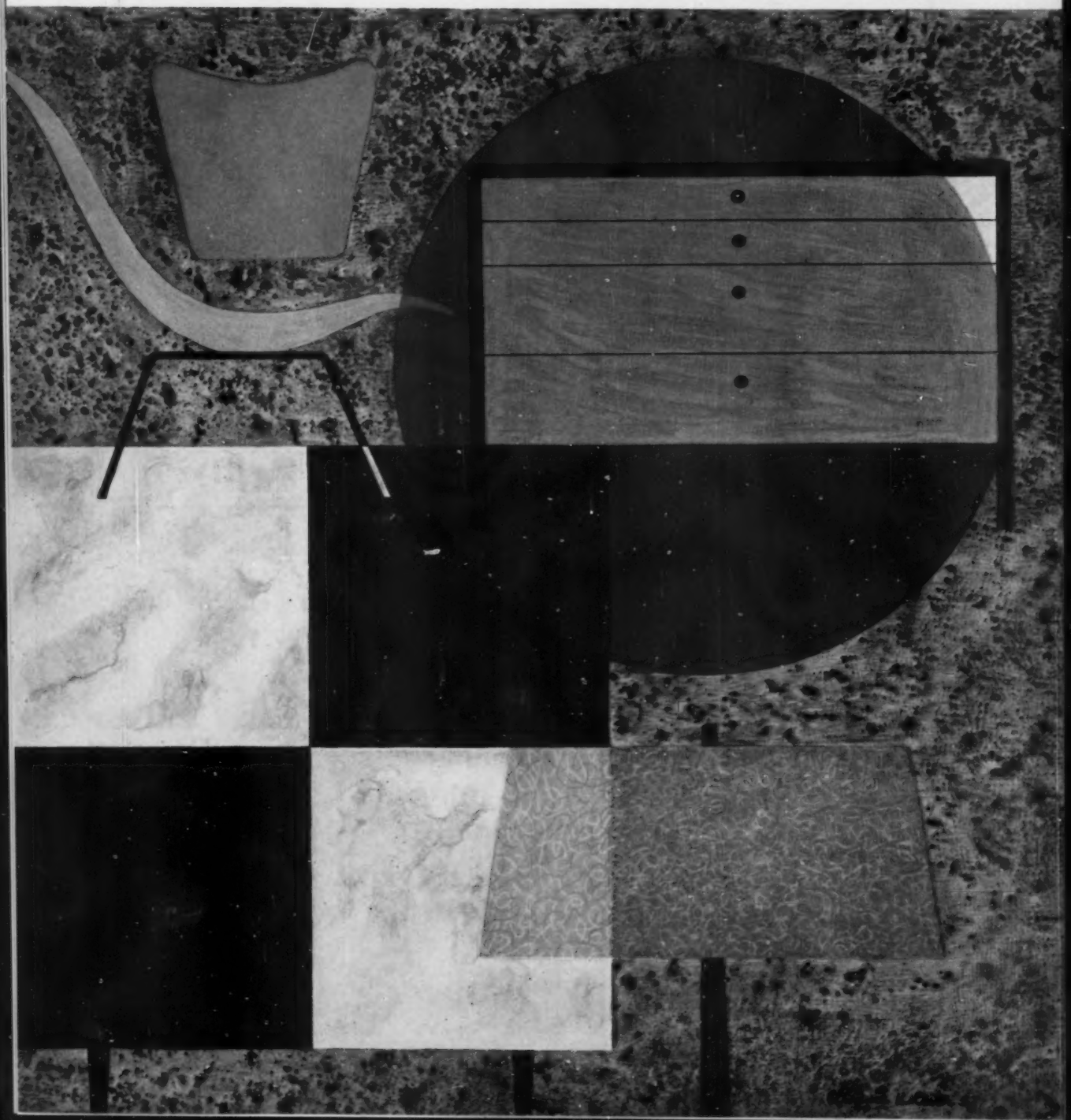
MODERN PLASTICS

JUNE 1958

How much heat can plastics take? *page 105*

What dustless vinyls mean to processors *page 131*

Plastics' stake in furniture *page 114*



Color helps sell these new Sunbeam electric fry pans and other Sunbeam Corporation appliances.

TO BRIGHTEN UP YOUR PRODUCT

Where do you want to put the selling power of *color* to work in your product?

Now you can get rigid, strong parts like these *in a whole spectrum of opaque, light-fast colors.* How? With a new, amazingly durable plastic molding material—*Durez polyester.*

These parts combine rugged strength with other qualities you'll find in no other color plastic. Their electrical properties are outstanding. They're inherently fire-resistant—meet Underwriters' requirements for appliances.

You can use Durez polyester in many places where you can't use other plastics, because *molded parts show virtually no change in dimensions after molding!*

Your molder can get this new plastic now in a variety of standard colors. It comes in a dry granular form and is easily molded on standard presses with compression or transfer molds.

If you'd like to brighten up your product with strong, dimensionally stable parts like these, ask us for illustrated Bulletin 200. It shows how leading manufacturers are using Durez polyester to spur sales of consumer products. Write DUREZ PLASTICS DIVISION, Hooker Electrochemical Company, 1206 Walck Road, North Tonawanda, New York.

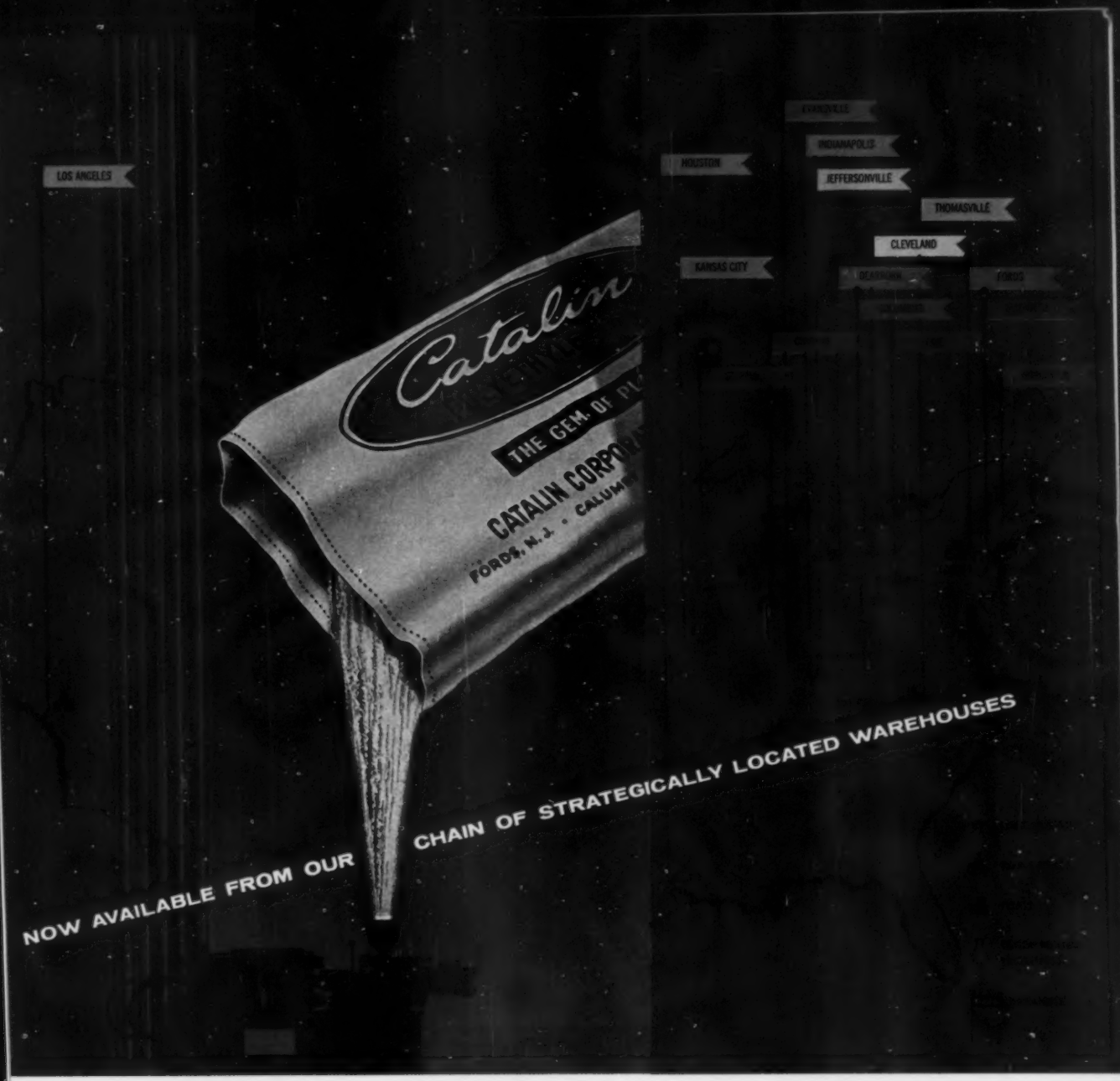
Solves shrinkage problem! These parts for Singer Sewing Machine Co., molded from Durez polyesters, retain their shape better than any other color plastic. Parts fit together better for faster assembly, fewer rejects.

DUREZ HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

1206 Walck Road, North Tonawanda, N. Y.



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POLYETHYLENE

molding, blow molding and extrusion compounds

This significant polyethylene announcement makes it possible to receive from a *single quality source* almost every type of high, intermediate and low density polyethylene, *with densities ranging from .915 to .96 and with melt indexes from 0.2 to 50.*

Already supplying a most comprehensive line of polystyrene, acrylonitrile styrene and nylon formulations, Catalin by this new addition makes it possible for the molder, blow molder and extruder with multiple production and end-use specification requirements to order and quickly obtain from one of Catalin's strategically located warehouses the exact type of material he needs, assured of unexcelled quality and service. *Inquiries invited.*

CATALIN CORPORATION OF AMERICA
One Park Avenue, New York 16, N. Y.

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Another new development using

B.F.Goodrich Chemical *raw materials*

This battery service kit, manufactured by The Sun Rubber Company, Barberton, Ohio, is rotationally cast from plastisols based on Geon resins supplied by B.F.Goodrich Chemical Company.

From Geon vinyl...a unique kit for "battery doctors"

HERE'S a new, unusual product rotationally cast from a plastisol based on Geon polyvinyl raw materials. It's a compact battery service kit—handy and handsome, too. It combines water reservoir, syringe and cell charge meter for faster battery check-ups.

Because it is made of Geon, this kit withstands battery acid, water, grease, oil and gasoline. It's light in weight but rugged—takes hard knocks, bumps and scrapes. Add resistance to alkalis and most chemicals, and you have a better picture of the outstanding properties that Geon can provide for *your* products.

Products of versatile Geon can be rotationally cast, extruded, slush molded, pressed, calendered, formed and blown. Applications range from corrosion-proof piping, phonograph records and foam safety padding, to tough colorful upholstery, wear-resistant flooring and coatings for paper, textiles and metal.

For information on Geon polyvinyl raw materials, write Dept. LE-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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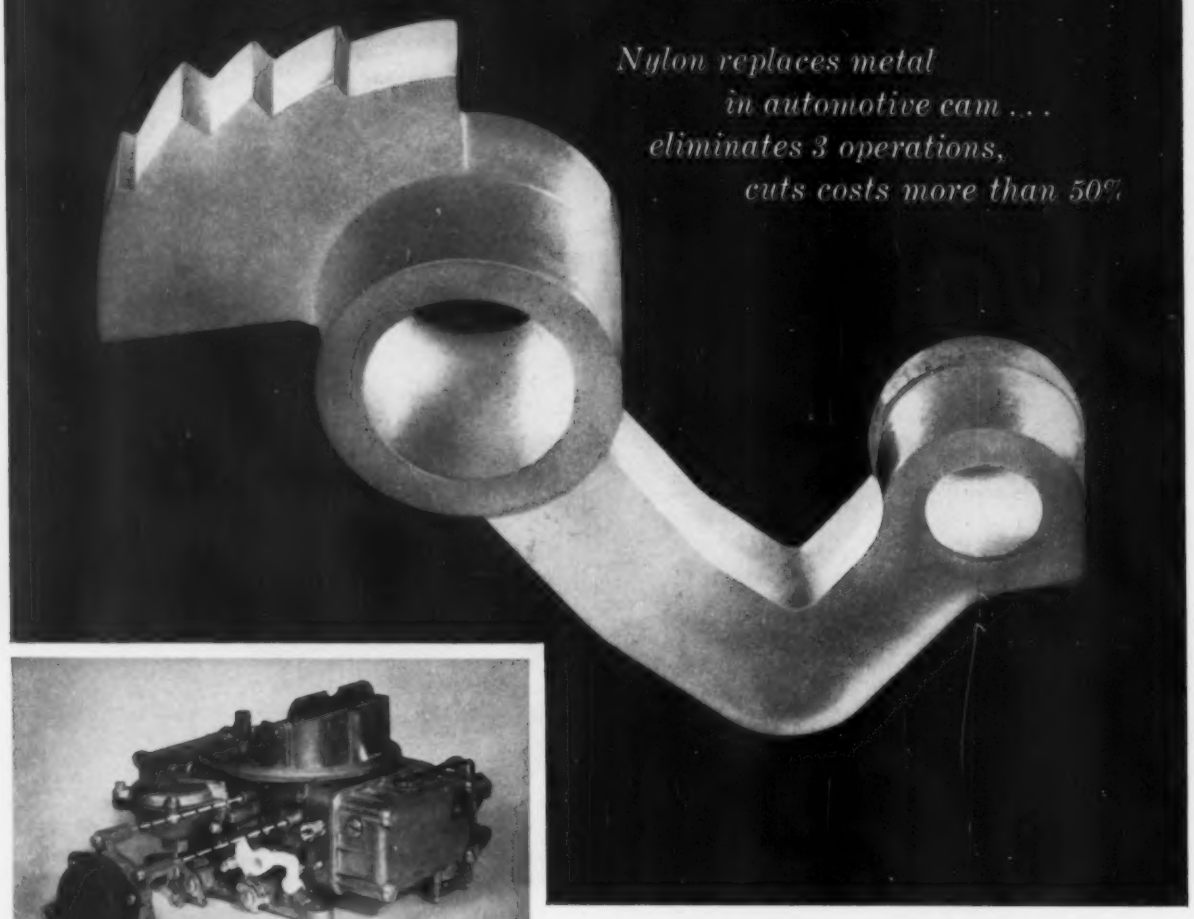
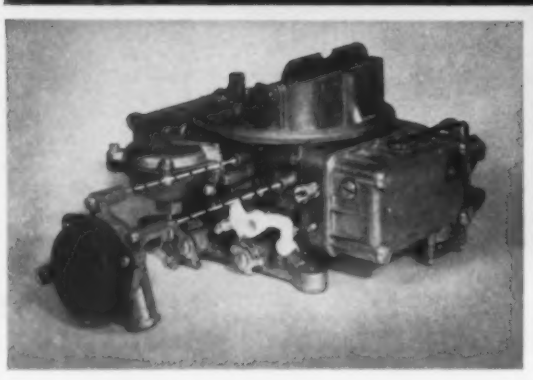
B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Here's the new nylon idling cam produced by Chicago Molded for Holley Carburetor





Many models of Ford Motor's Lincoln, Mercury and Edsel are equipped with latest-type Holley automatic carburetors. In inset photo, choke housing has been pulled away to show the molded nylon fast-idle cam as assembled.

This nylon fast-idle cam made by Chicago Molded for Holley offers less friction, and resists wear better than cams of low carbon steel. Furthermore, injection-molding it of nylon eliminates three operations – hardening, stamping, assembly – at production savings of more than fifty percent.

Holley is able to change the cam design without obsoleting the entire mold. That's because Chicago Molded designed a unique multiple-cavity mold made with removable sections. This permits easy changes in the number and sizes of the ratchets with very little expense, when the basic part is redesigned.

Designing and making molds that cut costs – and allow for low-cost changes – is a specialty of Chicago Molded's engineering staff. Why not find out if they can cut your costs? Ask, too, for a free subscription to *Plastics Progress* – the data-packed magazine on new developments in plastics. Write:

CHICAGO MOLDED
PRODUCTS CORPORATION
1046 North Kolmar Avenue, Chicago 51, Illinois

Editorial

Plastics and the I.S.O.

For seven years Technical Committee 61 (Plastics) of the International Standards Organization has been working to develop international standards for plastics materials and products in terms of test methods and specifications.

Yet this important activity has received less attention in the United States (where it was started by the American Standards Association) than in almost any other country.

Here is the record of growth: 1951, New York, 20 in attendance, 6 delegates representing 4 foreign countries; meetings held successively in Italy, Sweden, England, France, the Netherlands, and in 1957 in Switzerland where 100 delegates represented plastics industries from 16 countries. At last year's meeting action was taken on 16 test methods, bringing the total to 24 developed by this committee. A notable record.

Why are International Standards important to the United States plastics industry?

1) They can protect the fabricator, molder, ultimate consumer, and materials supplier from foreign dumping of inferior and off-grade plastic materials and items on the U. S. market.

2) Many U. S. plastics (materials and products) manufacturers are doing a significant amount of international business. They can now handle specification testing with one internationally accepted group of methods rather than several different national methods.

3) Many U. S. concerns have far-flung plastics operations and more appear to be on the horizon. International methods for plastics make it possible to set up a quality control and testing laboratory in one country with the same equipment and the same atmospheric conditioning facilities as in other countries concerned.

The eighth annual meeting of ISO/TC 61 will be held in Washington, D. C., November 3-8, 1958. Delegates have been invited to participate in a previous A.S.T.M. symposium on plastics testing and standardization at Philadelphia, Pa., October 30-31.

We urge all elements in the U. S. plastics industry and end-user industries to attend the Philadelphia meeting and to take part. Full information may be had from Mr. F. C. Frost, American Standards Association, 70 East 45th Street, New York 17, N. Y.

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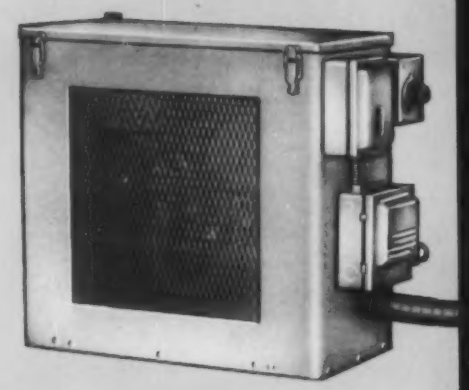
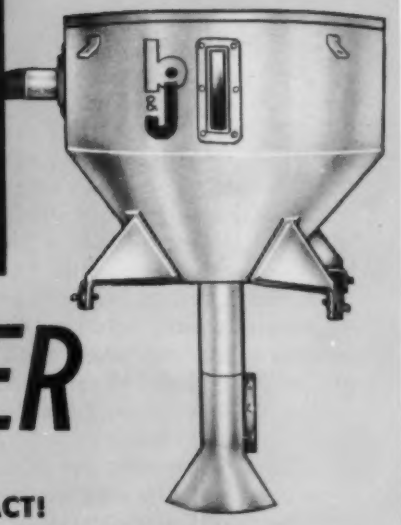


the money you save by eliminating rejects will pay for a



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The newly designed B & J Heater-Dryer will give you more full shots, better surface quality and improved physical properties with a greatly reduced reject rate that will save you money. In fact, the elimination of rejects will save you enough money to pay for a B & J Heater-Dryer that will condition, dry, and pre-heat the material right in the hopper of your injection molding or extruding machine. The Air-Maze filter, with washable filter element, removes dust and dirt from the air. The round B & J Hopper eliminates "dead" spots...heat is spread uniformly . . . moisture is dispersed faster. You get positive control of temperature from 150° to 235°F . . . with no chance for heat loss or contamination as can occur in transferring materials from drying ovens.

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WANT MORE INFORMATION?

Write today for Bulletin D558. It describes the B & J Heater-Dryer in detail. Also ask for our 8-page reprint of the results of a quantitative study of pre-heating polyethylene and impact polystyrene before extrusion.

B & J HEATER-DRYER ELIMINATES THESE COMMON CAUSES OF DEFECTS

DEFECT	CAUSE
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Brittleness	Improper welding due to cold material
Moist surface or cloudiness	Material too cold, material improperly dried

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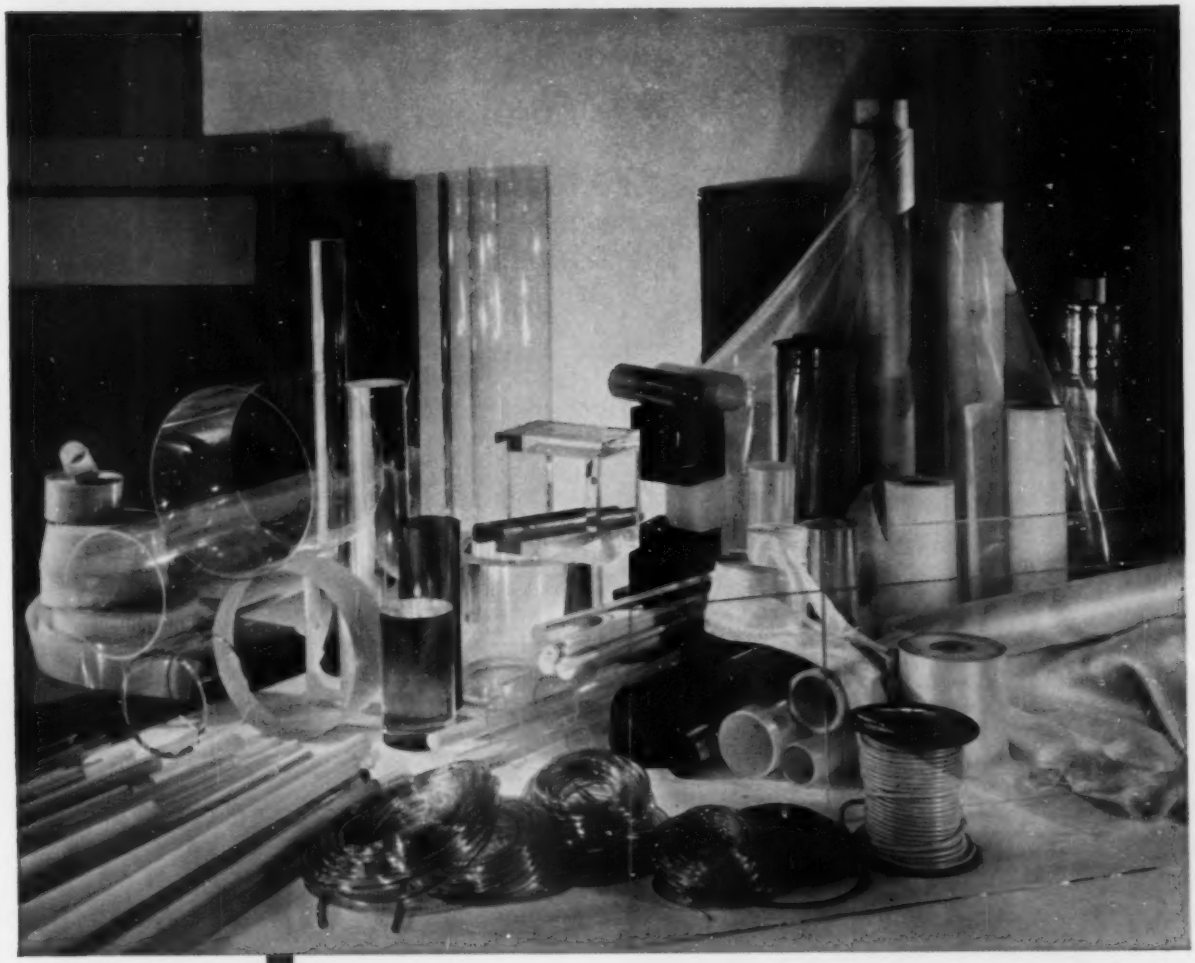

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Company_____

Here's your answer to rising costs

HOW D-M-E STANDARD MOLD BASES CAN KEEP YOUR MOLD COSTS DOWN DESPITE RISING COSTS OF STEEL, LABOR AND TOOLS

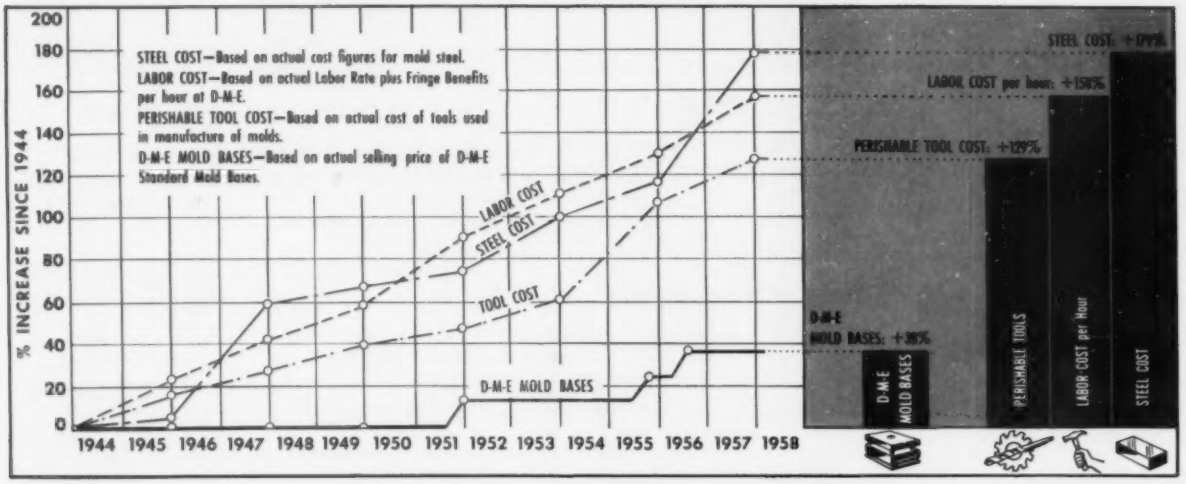
Whether to make or buy an industrial product is one of the most important decisions any manufacturer continually faces. To accurately judge the economy in D-M-E Mold Base standardization, basic cost factors were analyzed dating back to the origin of Standard Mold Bases by D-M-E over 15 years ago. The analysis is plotted on the graph shown below. How these factors affect the cost of the mold is what makes the important difference in whether to make or buy Standard Mold Bases.

Since 1944, the cost of steel has increased 179%; the hourly cost of labor has climbed 158% and the cost of perishable tools has gone up 129%! In the same period the net selling price of D-M-E Standard Mold Bases has increased only a fraction of these amounts.

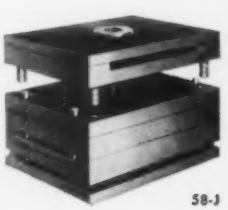
For the mold builder making his own mold bases throughout this period, rising steel, labor and tool costs are reflected in the increased cost of his own finished molds. The savings to the mold builder who long ago recognized the advantages of Standard Mold Bases, become immediately obvious.

The company using D-M-E Standard Mold Bases today not only saves money NOW, but can rely on a more stable cost factor for anticipated mold building programs. At the same time investment capital is freed for equipment more suited to special requirements.

Why it costs less to buy D-M-E standard mold bases than it does to make your own



WRITE FOR the April issue of the D-M-E News giving complete details on "How to reduce mold costs". Or contact your nearest D-M-E Branch for the 170 page Catalog of Standard Mold Bases and Moldmakers' Supplies. Start saving Now!



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DME DETROIT MOLD ENGINEERING COMPANY

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- D-M-E of CANADA, TORONTO, ONT.: 156 Norseman Ave.

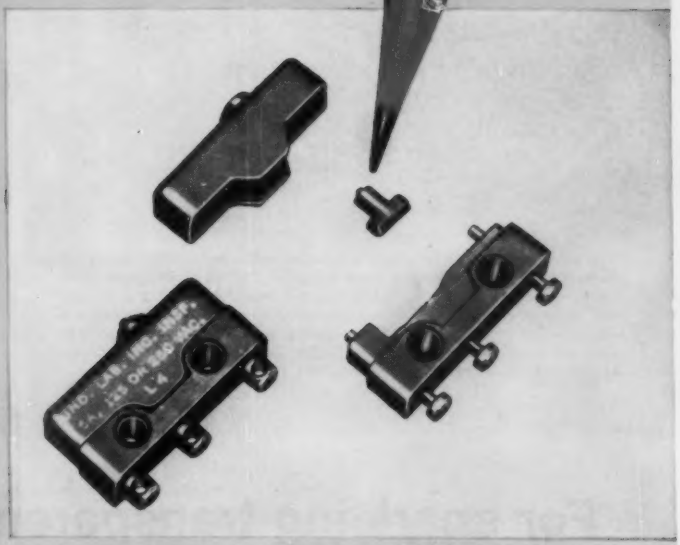
MICRO SWITCH, a Division of Minneapolis-Honeywell Regulator Company, Freeport, Illinois, recently installed *three* new Baker automatic molding machines. On one typical job they realized an annual savings of $42,800. Stepping up from a 24-cavity to a 40-cavity mold on this application, MICRO SWITCH gained an immediate 67% *increase* in capacity. Automatic operation of the new Baker *reduced* manpower needs 75%. Running through lunch hours yielded a 14% *increase* in production time. Resultant savings more than paid for the machine and the tooling. Write BAKER BROTHERS, INC., 1010 Post Street, Toledo 10, Ohio.

$42,800 saved at MICRO SWITCH with BAKER automatic molding

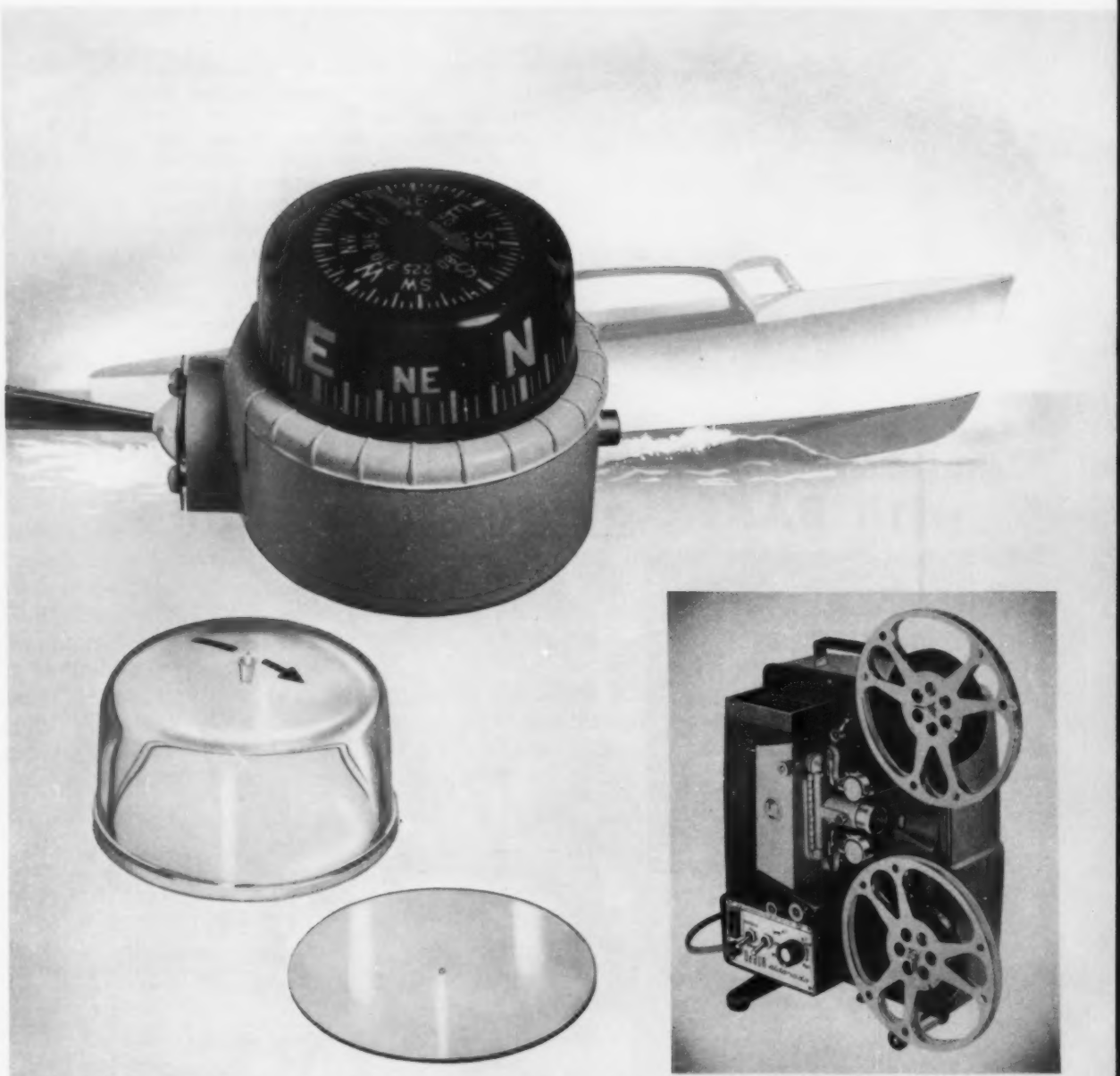
One of three new Baker automatics at MICRO SWITCH

BAKER®

AUTOMATIC MOLDING MACHINES



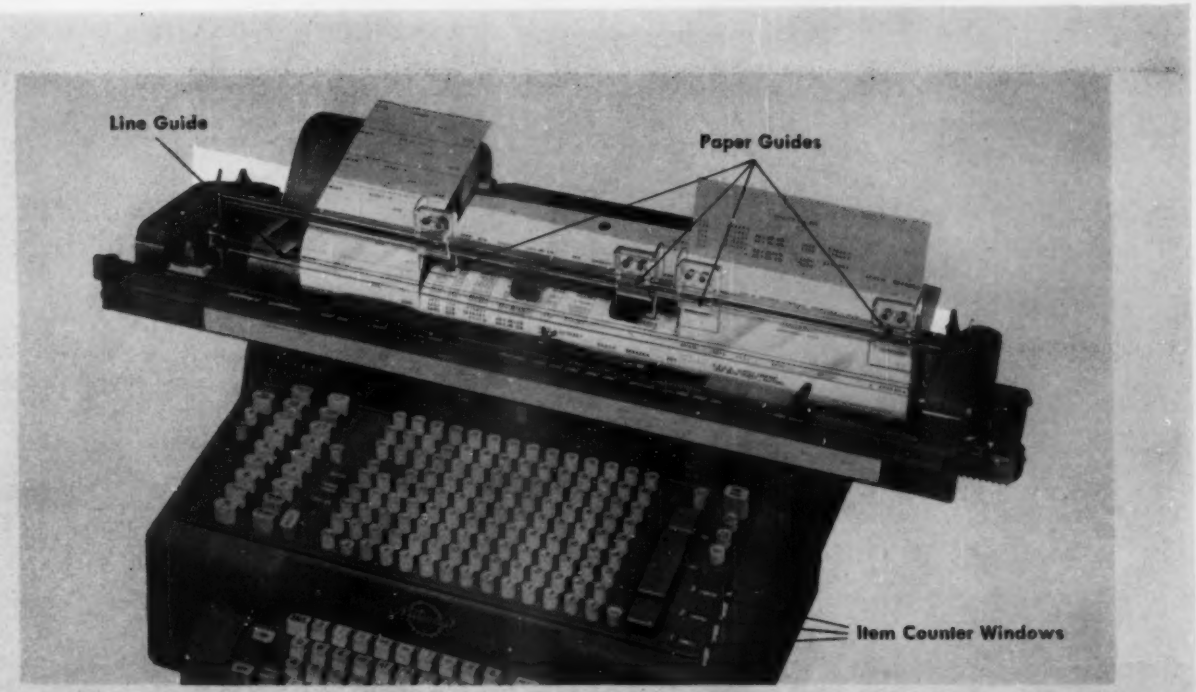
Two of 10,000 different MICRO SWITCH *precision* switches. Total molding requirements: 40 million *precision* parts per year.



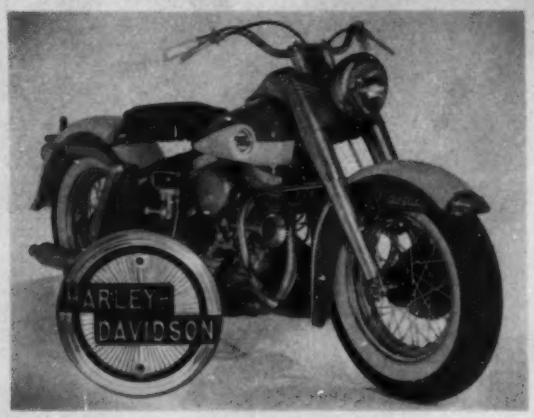
NAVIGATOR COMPASS for car or boat features a self-illuminated, liquid-filled dome and bearing cover plate crystal of Du Pont LUCITE acrylic resin. LUCITE was specified because of its superior optical properties, toughness and corrosion resistance. Its shatter-resistance keeps shipment damage to a minimum. Red arrow on top outside surface and red line on peripheral face were hot-stamped on dome. (Molded for Taylor Instrument Companies, Rochester, N. Y., by Nosco Plastics, Inc., Erie, Pa.)

INSTRUMENT PANEL of transparent LUCITE mounted on aluminized foil makes centralized controls easy to read while projecting 8-mm. movies in darkened room, for LUCITE transmits about 92% of light striking it. Available in a wide range of transparent, translucent and opaque colors, LUCITE is economically molded to close tolerances. (Panel molded for deJur Amsco Corporation, Long Island City, N. Y., by Jamison Plastics Corp., North Bellmore, N. Y.)

For sparkling transparency and exceptional durability...they specified LUCITE®



LINE GUIDE, PAPER GUIDES, and **ITEM COUNTER WINDOWS** on NCR accounting machine are molded of LUCITE acrylic resin to provide better visual control. Operator can see previous and present postings, which increases accuracy, insures correct form alignment, simplifies posting procedure and permits sight-audit of all entries and balances picked up. (Parts of LUCITE manufactured by Molding Section of The National Cash Register Company, Dayton, Ohio.)



MOTORCYCLE MEDALLION of LUCITE has a three-dimensional effect achieved through back-painting in gold, silver and black. This beautiful emblem is visible for great distances, and its optical properties will not be affected by age, sunlight or moisture. Because LUCITE has remarkable weather resistance, the medallion will maintain its color and appearance through years of outdoor exposure. (Molded for Harley-Davidson Motor Co., Milwaukee, Wis., by Gits Molding Corporation, Chicago, Ill.)

LENS for the Westclox Baby Ben Electric Clock is molded of LUCITE for crystal-clear transparency. LUCITE offers transmission and refractive index comparable to those of the finest optical glass. Moreover, its high impact strength and shatter resistance facilitate handling. Unusual sizes and shapes for lenses and prisms are easy to mold with LUCITE. (Lens above molded by Athens Div. of General Time, Inc., Athens, Georgia.)

AT YOUR COMMAND: As a present or prospective user of LUCITE acrylic resin, Du Pont offers you the services of an experienced group of plastics technicians. For more information, write now to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 276, Wilmington 98, Delaware. *In Canada:* Du Pont Company of Canada (1956) Limited, P. O. Box 660, Montreal, Quebec.

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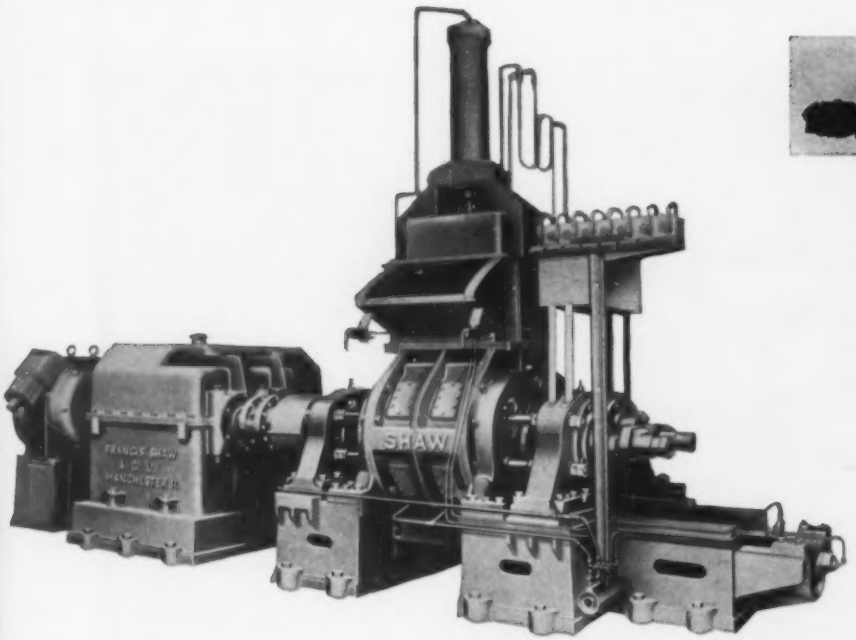

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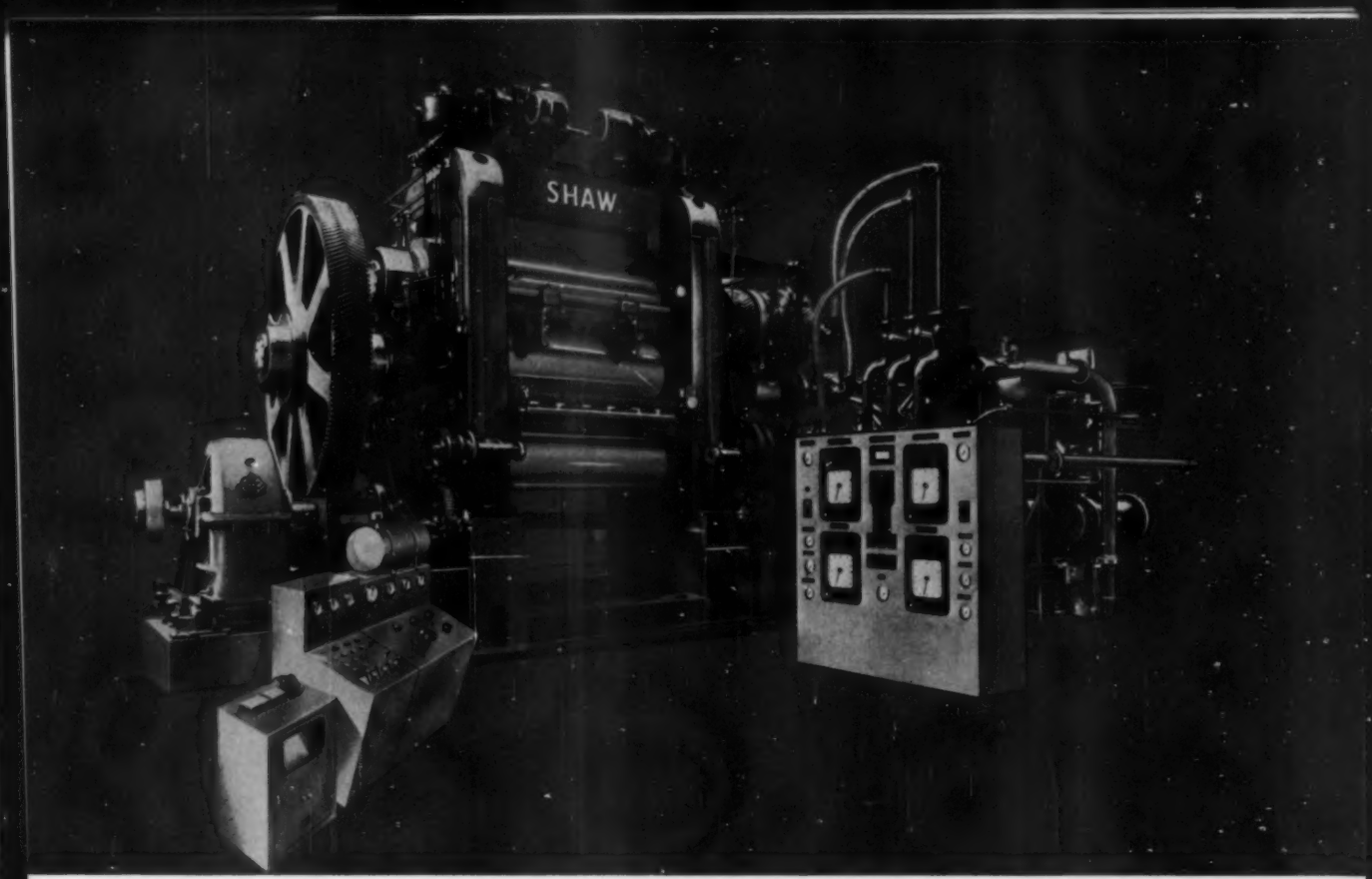
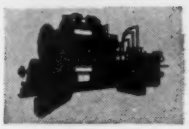
Francis Shaw are available for the design, manufacture, and installation of a wide range of processing equipment

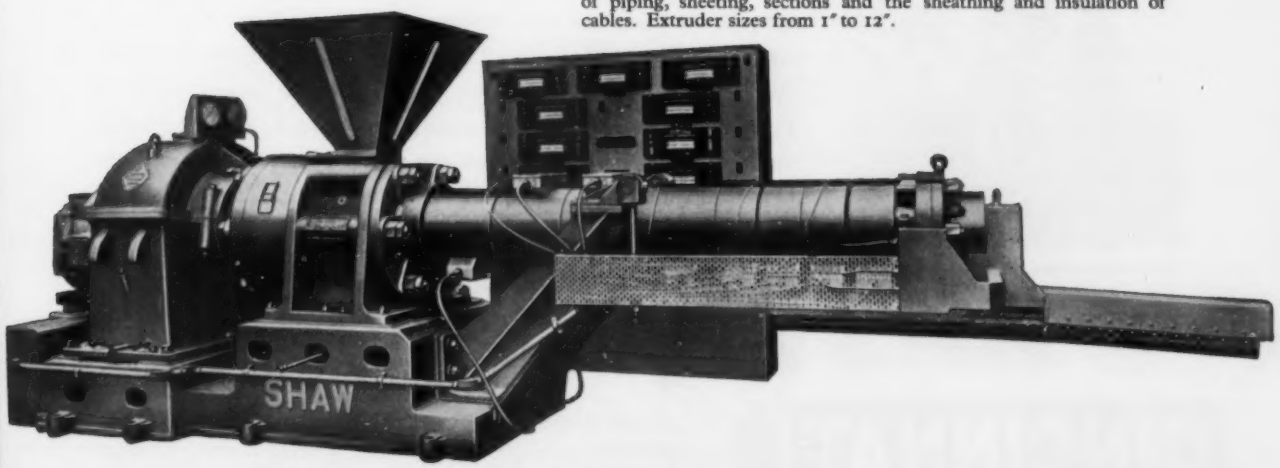




CALENDER. A comprehensive range of Francis Shaw Calenders is available for the processing of all rubber and plastic materials. Flood lubrication and hydraulic roll balancing available on all production sizes. Roll Bending can be fitted as an additional refinement. All sizes available from 13″ x 6″ to 92″ x 32″. Two-, Three- and Four-Bowl Designs.

QUALITY ENGINEERING FOR QUANTITY PRODUCTION

PLASTIC EXTRUDER. Fine temperature control is a vital feature of Francis Shaw extruders. All-electric heating in separate zones is provided, each zone being separately controlled by proportioning instruments. A wide range of screw and die designs is available for the production of piping, sheeting, sections and the sheathing and insulation of cables. Extruder sizes from 1″ to 12″.

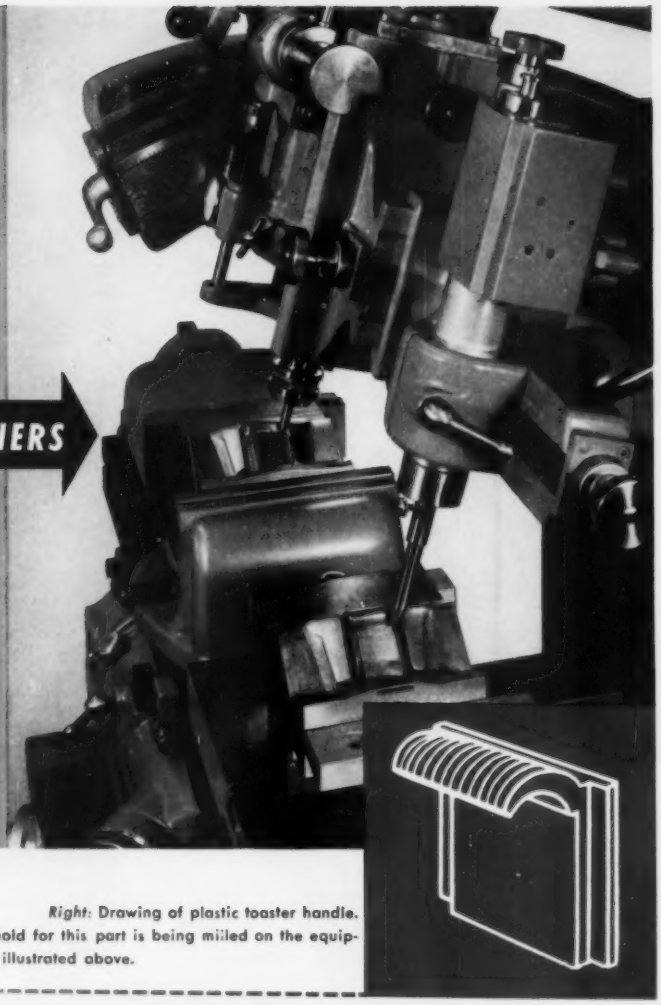


FRANCIS SHAW (CANADA) LTD GRAHAMS LANE BURLINGTON ONTARIO CANADA

TELEPHONE NELSON 4-2350 TELEGRAMS CALENDER BURLINGTON ONTARIO

Subsidiary of FRANCIS SHAW & CO LTD MANCHESTER 11 ENGLAND TELEX 66-357

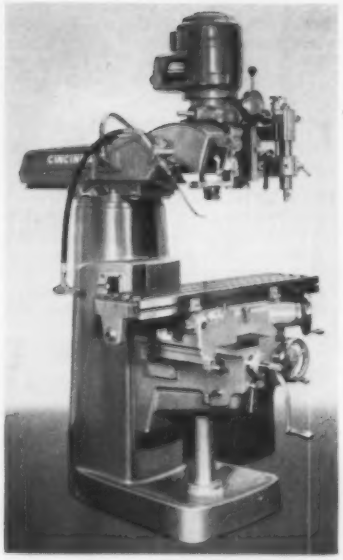
The cutter and tracing head of this CINCINNATI Contourmaster Tool and Die Miller has been swiveled a few degrees to mill corners and the straight walls in a mold for a plastic handle.



IT REACHES INTO THE CORNERS

and ELIMINATES A LOT OF HAND FINISHING

Right: Drawing of plastic toaster handle. The mold for this part is being milled on the equipment illustrated above.



CINCINNATI Contourmaster Tool and Die Milling Machine. Catalog No. M-1919-2 contains complete specifications. Write for a copy.

● Hard-to-get-at corners of a mold need not be such a big factor in the cost of hand finishing. Clean them out accurately on the die-sinking machine, and you will see hand finishing costs drop sharply. This is one of the advantages offered by CINCINNATI Contourmaster Tool and Die Millers. ¶ The cutter spindle and tracing head may be swiveled as a unit 15° front or 35° back. Tracing and milling then proceed in the usual manner. The setup above illustrates this feature in milling a mold for a plastic handle. Other CINCINNATI Contourmaster features are equally important in making plastic molds . . . handwheel table traverse with anti-friction screw; light pressure, automatic tracing; slotting attachment, if desired. Complete data may be obtained by writing for catalog No. M-1919-2.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CINCINNATI®

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • SPECIAL MACHINE TOOLS • METAL FORMING MACHINES HARDENING MACHINES • CUTTING FLUIDS • GRINDING WHEELS

Photo courtesy American Optical Company, Southbridge, Mass.

It's the optimum for opticals!

We think you'll find the optimum in both protection and comfort in the safety goggles pictured above. And one big reason is their lightweight, transparent, flexible frame made of PLIOVIC S70.

PLIOVIC S70 is a new and unique polyvinyl chloride resin. Its medium viscosity and fine particle size are specifically designed for applications where exceptional clarity and maximum flow at moderate temperatures are desired. And these are just the properties required to injection mold an optically clear, impact-resistant, long-lasting frame – easily and economically.

Goggle frames are but one use for PLIOVIC S70. It also can be used to advantage, alone or as a modifier of higher modulus stocks, in calendered and extruded applications where processing is critical or exceptional clarity is needed. For details, including the latest *Tech Book Bulletins*, on PLIOVIC S70 or other PLIOVIC resins, just write to: Goodyear, Chemical Division, Dept. O-9441, Akron 16, Ohio.

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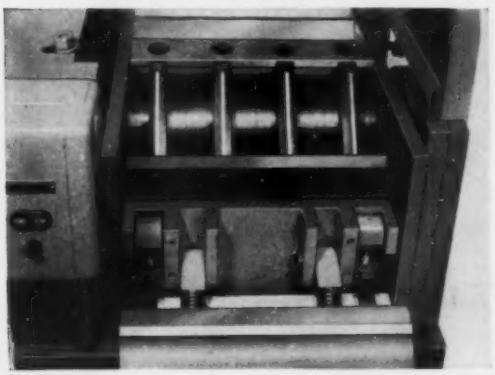
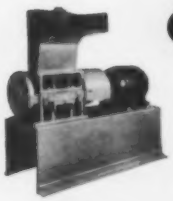
TWO NEW
Cumberland
Beside The Press
GRANULATING MACHINES

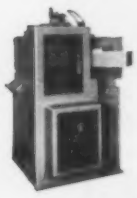


PART OF THE COMPLETE LINE OF CUMBERLAND PELLETIZERS, BESIDE THE PRESS AND CENTRAL GRANULATING MACHINES, DICERS, CHOPPERS AND PRE-BREAKERS



CENTRAL GRANULATING MACHINES

The Cumberland Model 20 shown left is one of a series of rugged, high quality central granulators offering a choice of throat openings and power.



STAIR STEP DICER

Produces perfect cubes or pellets 1/16" to 1". Two standard sizes accommodate up to 7" and up to 14" ribbons.

LARGE THROAT OPENINGS – 12" x 16" (Shown above). Companion machine has throat opening 8½"x12".

QUALITY CONSTRUCTED entirely of steel weldments. Advanced design leaves all working parts readily accessible for cleaning and adjustment of knives.

NEW PERFORMANCE – New knife design and slow rotor rpm provide better granulation and quiet operation. Clean cutting of the complete range of thermoplastic materials from softest polyethylene and vinyls to hard and tough nylon, Cycolac, and Kralastic.

MINIMUM FLOOR AREA – Model 12" x 16" requires only 26" x 26". Model 8½" x 12" requires only 22" x 24".

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  —**"CUT COSTS WITHOUT SACRIFICING QUALITY"**—Supplied in uniform, dust-free pellets . . . perfectly matched from first bag to last.
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COLLARS FOR GIANT NECKS – This roll neck bearing, shown during one of its final production stages at the Westinghouse plant in Hampton, South Carolina is made of a versatile plastic laminate called Micarta. Developed and produced by the Westinghouse Electric Corporation, Micarta has a number of properties that make it ideal for bearing and gear fabrication. Light in weight, it is strong and resilient, easy to machine, and has a high resistance to heat and corrosion. In steel mill applications Micarta roll neck bearings have out-performed ordinary metal bearings by as much as 100 to 1, and other non-metallic bearings by as much as 3 to 1. Micarta is made from a fabric base impregnated with synthetic resin and subjected to tremendous heat and pressure. The fabric used for the production of these Micarta bearings is Mount Vernon duck.

This is another example of how fabrics made by Mount Vernon Mills, Inc. and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

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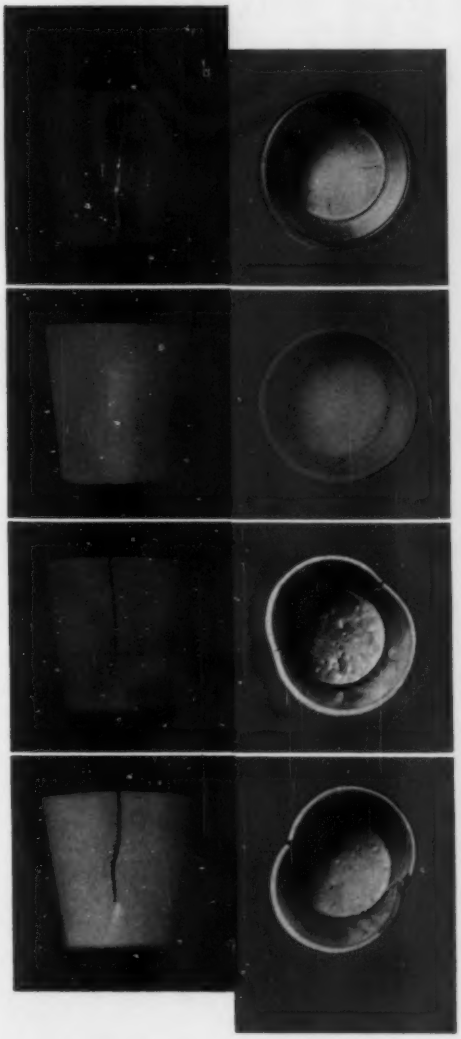
of **DAPON**® resin's outstanding stability under heat and humidity

As graphically shown here, Dapon Resin does not distort, degrade or discolor under long exposure to high heat and humidity. This outstanding dimensional stability, coupled with Dapon Resin's high electrical properties and chemical stability even under extreme conditions, may provide the answer to your high-temperature high-humidity plastics stability problems.

Dapon Resin is easily compounded with a wide variety of mineral and fibrous fillers and has extremely low molding and post-mold shrinkage. And in addition, Dapon Resin can be molded in a range of solid and pastel colors.



MELAMINE "A"
after 10 days under test

DAPON
after 90 days under test

POLYESTER "A"
after 18 days under test

POLYESTER "B"
after 22 days under test

TEST DATA: An equal number of test cups were molded under normal conditions from commercial polyester, melamine and DAPON Resin. The cups were half filled with tap water and placed in a laboratory oven at a constant 212°F temperature, the water being replaced daily. The cups were examined at regular intervals and removed from the oven when they had reached the condition shown in the unretouched illustration.

At your request, we will be glad to send you complete technical data on Dapon Resin so that you can investigate this unusual plastic as the answer to your specific problems.

Properties of **DAPON**® Resin

Stable, free-flowing white powder • Easy to store, easy to mold, easy to color • Molded products have excellent surface finish • Good physical strength • Low moisture absorption • Chemically resistant • High-temperature and high-humidity resistance • Outstanding dimensional and chemical stability • Fine electrical properties even at high-temperature and high-humidity.

**DAPON Resin is the registered trade name of Food Machinery and Chemical Corporation's brand of diallyl phthalate prepolymer.*

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FOOD MACHINERY AND CHEMICAL CORPORATION

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- **PROVEN** in nearly 1000 installations on every make and model of injection machine.

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IMS offers 2½ to 3 weeks delivery on Quality Replacement Heating Cylinders, engineered to meet your requirements.

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Send for our Heater "How Book" today. It tells about the men and materials that combine to give you IMS Standardized Design Replacement Heating Cylinders.

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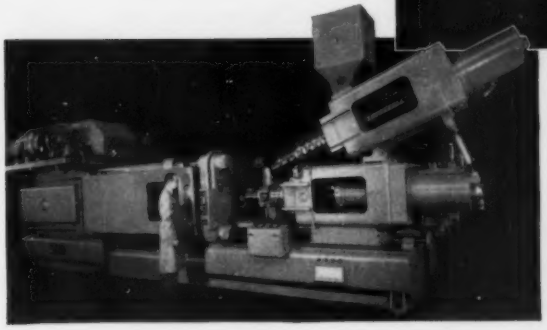
MACHINE OF THE FUTURE,

Says Federal Tool Corp. Molding Supt. Al Pickhardt:

"We are so thoroughly convinced that our new H-P-M Model 800-P-200 Preplasticizer is the machine of the future that we ordered another, larger machine (1500 ton, 300 oz.) just like it."

PART—Polyethylene Brine Tank
WEIGHT—100 ounces
SIZE—Depth 27"; Diameter 21"
MOLDED ON—H-P-M's New Model 800-P-200 Preplasticizer

A new design concept in preplasticizing, this H-P-M 800-ton unit, with 225 H.P. system, provides an exceptionally high injection rate of 5,400 cu. in. of material per minute. It will increase the speed of large parts production for Federal Tool Corp., Chicago, by nearly 100%. It has a 54" stroke, 84" daylight and a mold mounting area of 36"x55" . . . an ideal machine for large, deep parts such as the huge salt storage container for Culligan automatic water softeners shown at the right.



H-P-M Model 800-P-200 Preplasticizing Injection Machine, a new design concept in preplasticizing.

This big laundry basket is molded by Federal Tool on the new H-P-M 200-oz. at the rate of over 2/minute.

H-P-M's out in front in the booming plastics industry with new machines, new hydraulic systems, faster injection speeds . . . a machine for every molding job. If you're planning to mold it—H-P-M makes a machine to do it. Write today, for complete information.

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Here's a fellow who sells a heck of a lot of snake oil and elixir, and he doesn't much care *how* he sells it. Fortunately, he's not the only type of salesman you might come across, though. Take the typical Boonton salesman. He's about as far removed from this fast-talking pitchman as you can get.

You see, the Boonton representative isn't just a salesman. He's a plastics engineer, as well. That means when he goes out to talk to you there's no fancy double talk . . . he talks plastics.

Boonton salesmen are graduates of our factory, not just ninety-day wonders, either. They know from practical and sometimes sad experience just how expensive close tolerances can be, or how careless piece design can complicate production problems.

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So why not have us send a representative over just to chat with you about compression and injection molding. There'll be no obligation . . . or high-pressure stuff, either. High-pressure's reserved for our molding presses.

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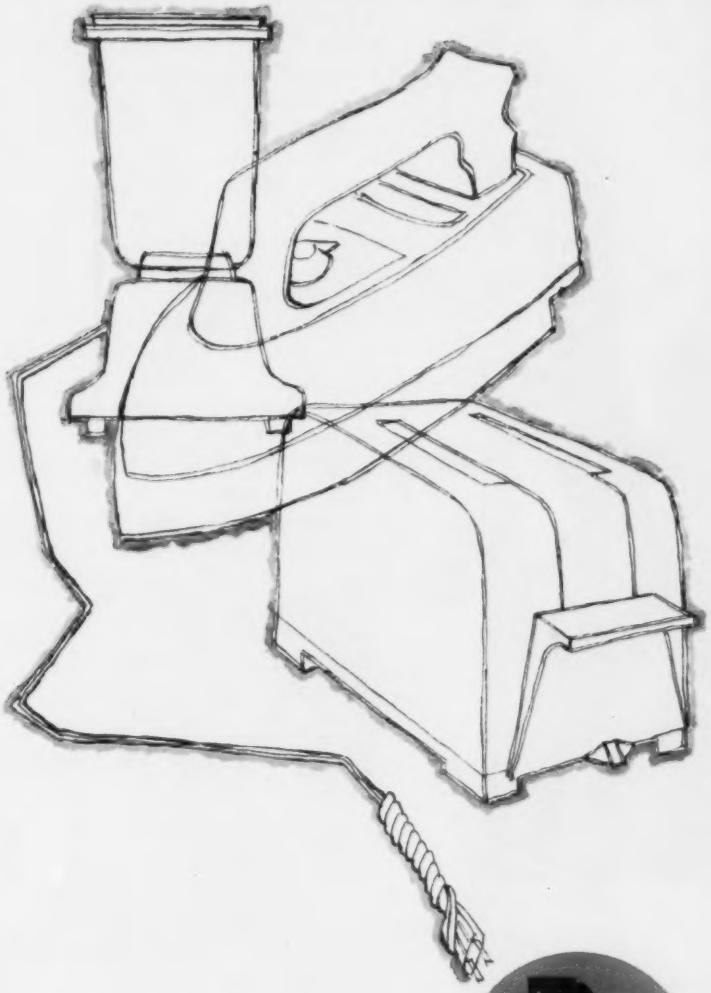
new from

PLENCO



two improved heat resisting phenolic molding compounds that provide:

40% greater impact strength
PLENCO 466 H. R. BLACK

Resists heat of 450° F. over long exposures with, however, added impact strength, which—in the case of 466—is .42 ft. lbs. per inch of notch compared to .30 of ordinary heat resisting formulations. That's a 40% increase, and most valuable when considering the shock and abuse to which appliances, for example, are subject.

extra-low specific gravity
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Gaining wide acceptance on applications where 400° F. over long exposure is adequate. Possesses a specific gravity of only 1.45, unusually low for a heat resisting material. Not only can more pieces per pound be made with Plenco 485, but the formulation is easy on the molds because of its extremely low mold erosion characteristics.

MANUFACTURERS OF APPLIANCES and electrical parts will find these two new Plenco-produced compounds advantageous when higher than general purpose heat resistance and impact strengths are required.

In addition, both Plenco materials have excellent moldability, giving high gloss surface finish with a fast, rigid set, and low shrinkage essential for efficient production. Detailed data sheets are available upon request. So is consultation with our technical staff about your particular molding problem. If phenolics is the answer . . . Plenco can provide it.

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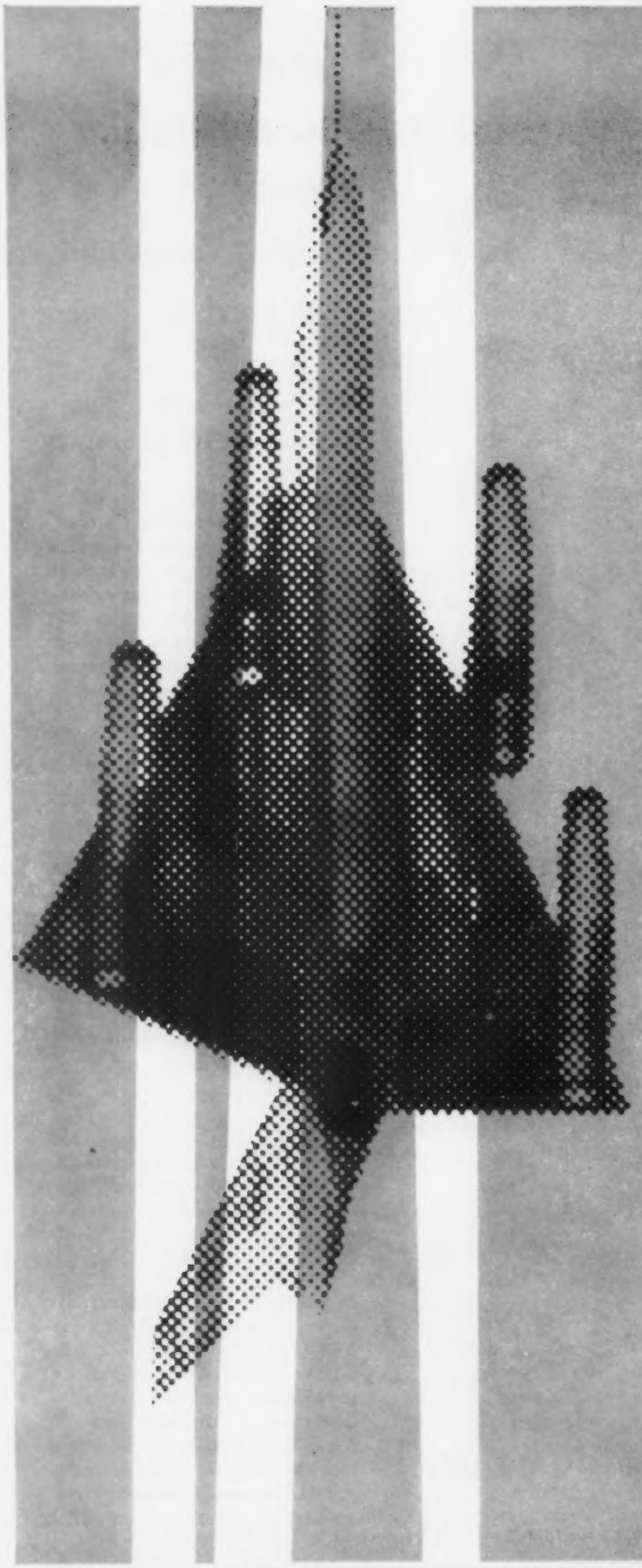
Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.



WORLD'S HOTTEST jet bomber flies real cool. When it comes to supersonic flight the speed limit is set by aerodynamic heat. That's why heat-resistant glass fabric honeycomb made of Trevarno glass fibre sandwiched between metal skins — helps give Convair's B-58 Hustler speed unmatched by any other bomber. Trevarno glass fabric honeycomb is so successful in reducing internal temperature, this material in the bomber's wings has been termed "one of the most vital achievements in recent years" by Air Force officials. Even though the material is a major break-through for the B-58, more important, it paves the way for new missile development and for even more advanced aircraft in the future. Write today for data on Phenolic, Epoxy, Silicone, Polyester resin systems, or on custom impregnations for special applications. High glass moulding compounds in above resin systems also available. For further information contact Coast Manufacturing & Supply Company, P.O. Box 71, Livermore, California. Sales Offices: 4924 Greenville Avenue, Dallas, Texas; 635 South Kenmore, Los Angeles, Calif.

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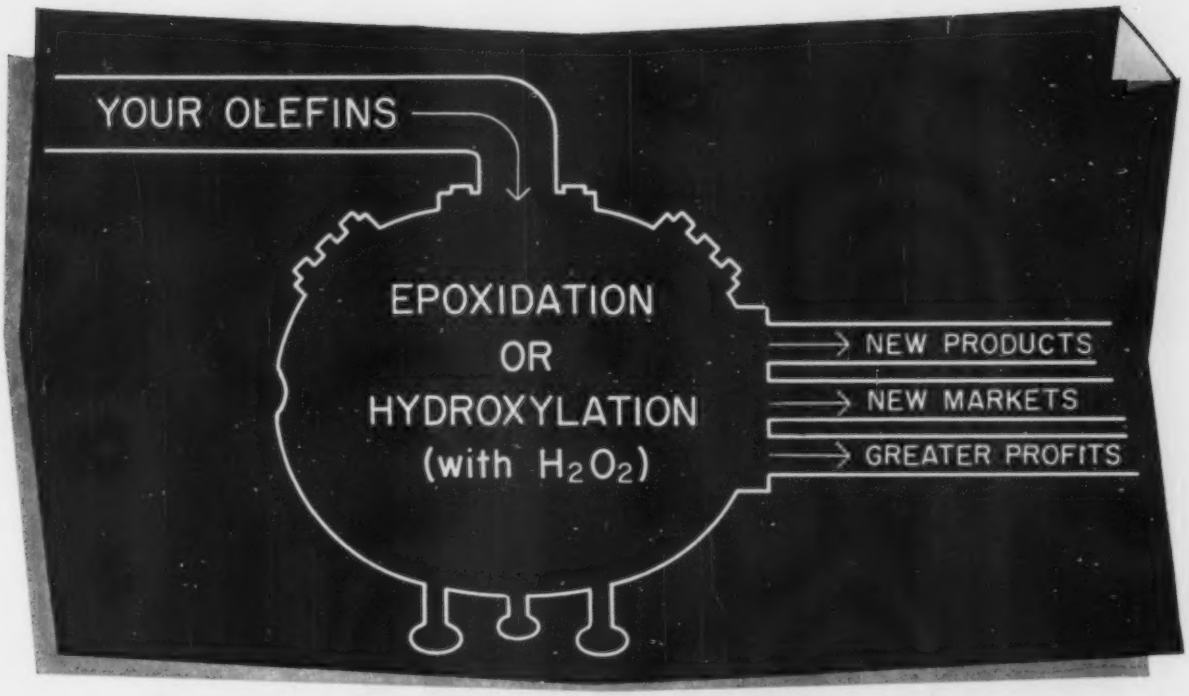

Blueprint for upgrading olefins with

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Epoxidation or hydroxylation by means of SOLVAY Hydrogen Peroxide offers olefin processors a method of upgrading their products into higher profit items for new markets.

Typical higher profit products now being successfully produced by olefin epoxidation or hydroxylation are: resin plasticizers, glycols, stabilizers, reactivated intermediates, insecticides, polymers, lubricants, waxes, surfactants and brake fluids. Synthetic olefins and those derived from natural oils commonly used include: alkyl oleates, terpenes, alkyl tallates, acetylated monoglycerides, natural unsaturated triglycerides and other unsaturated aliphatic hydrocarbons.

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New Booklet Available

Write for this new review and bibliography on epoxidation and hydroxylation with SOLVAY Hydrogen Peroxide as a means of upgrading olefins. It contains facts, describes the methods, and lists many present and potential applications.

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☐ Please send me without obligation your booklet, "SOLVAY Hydrogen Peroxide for Epoxidation or Hydroxylation."
☐ Have one of your representatives call to discuss it.

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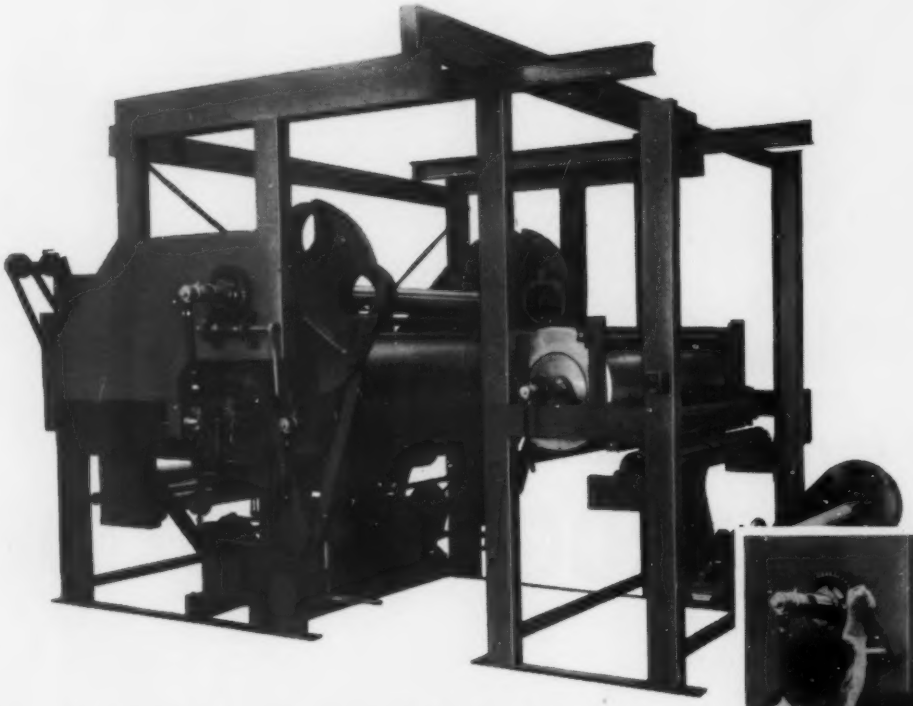
New Lembo
TURRET EMBOSSER



Leave it to Lembo to come up with this handy, practical development on their Embosser. The necessity for frequent shut downs and roll changing in embossing heads is just about eliminated, thanks to the 2-, 3- or 4-roll turret.

Rolls can be changed in a minute or two; either manually or with optional motor drive. Just index to use any of the patterns on whatever plastic film you happen to be running.

Extra! New slat expander, now standard equipment on all Lembo Embossers. Maintains constant width on 60 or 80" face. Also available with new Variable Tension Controller.

Call now! We'll be happy to let you see the new Lembo Turret Embosser in operation.

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8 ft. long model fountain pen made from green and yellow 'Perspex' by Butler Plastics Ltd., Johannesburg, and displayed in Salisbury, S. Rhodesia.

'Perspex' catches the eye of the world

DISPLAY SIGNS made from 'Perspex' acrylic sheet attract attention day and night. They are easily remembered. They sell. Throughout the world 'Perspex' is helping to increase demand for an enormous range of goods and services.

No wonder 'Perspex' is chosen for outdoors: it combines robustness with good looks, and it retains its good looks through all kinds of weather. It's light and, because it is easily handled, offers great scope for the inventive designer. And transparent 'Perspex' can be illuminated for round-the-clock selling.

With 'Perspex' the designer can think in terms of bright, eye-catching colour, because it is available in a wide range of transparent, translucent and opaque colours as well as in clear or opal sheet.

This 'Perspex' sign, one of many made by AB Wetaplast/Moorneon, Stockholm, for a large Swedish private rescue organisation, is internally lit by fluorescent tubes.

Butler Plastics Ltd. made this illuminated sign in Durban from yellow and red 'Perspex'.

One hundred times the size of the original, this is one of the many cigarette pack displays made from 'Perspex' by The Todwil Co. of S. Africa (Pty) Ltd. for use at leading airports.

This 7 ft. high model specially commissioned for exhibition at the 1957 Toronto Fair, was made by The Todwil Co. of S. Africa (Pty) Ltd. in opal, blue, gold and red 'Perspex'.

'PERSPEX'

'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.

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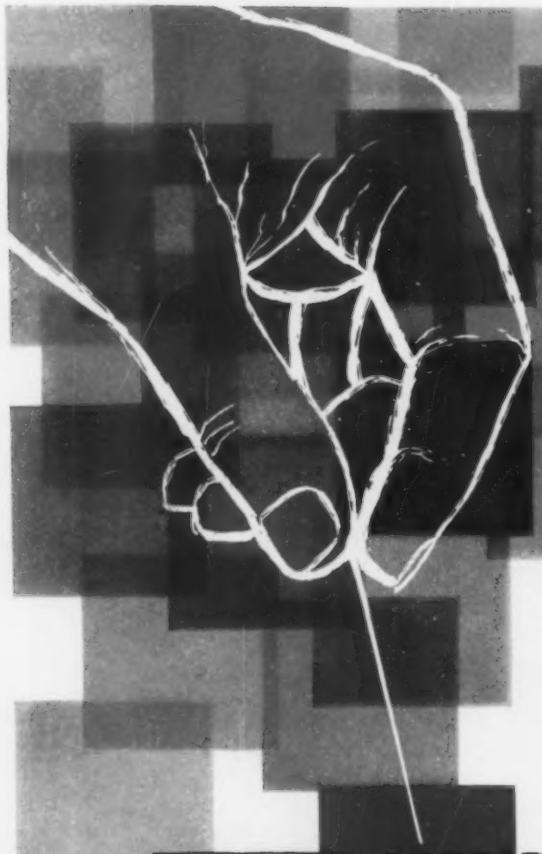

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is the polystyrene with this difference: proof of performance plus personalized service. And what a difference it makes in cutting costly rejects! Investigate FOSTARENE for your molding operations.

NOW! . . . pinpoint accuracy to solve your toughest color problems!

The new FOSTARENE color-blending plant is the last word in facilities, capacity, personnel — and *flexibility*. Now you can get quick, accurate service *even on small orders*. Up-to-the-minute color blending processes permit production of a full range of colors *without* contamination. Colors are continuously checked on the most modern equipment, including D. U. and Rapid Scanning Spectrophotometers, Lumetron Colorimeter and Macbeth Artificial Light. Give us your toughest, most elusive color-matching problems. We take them in stride!

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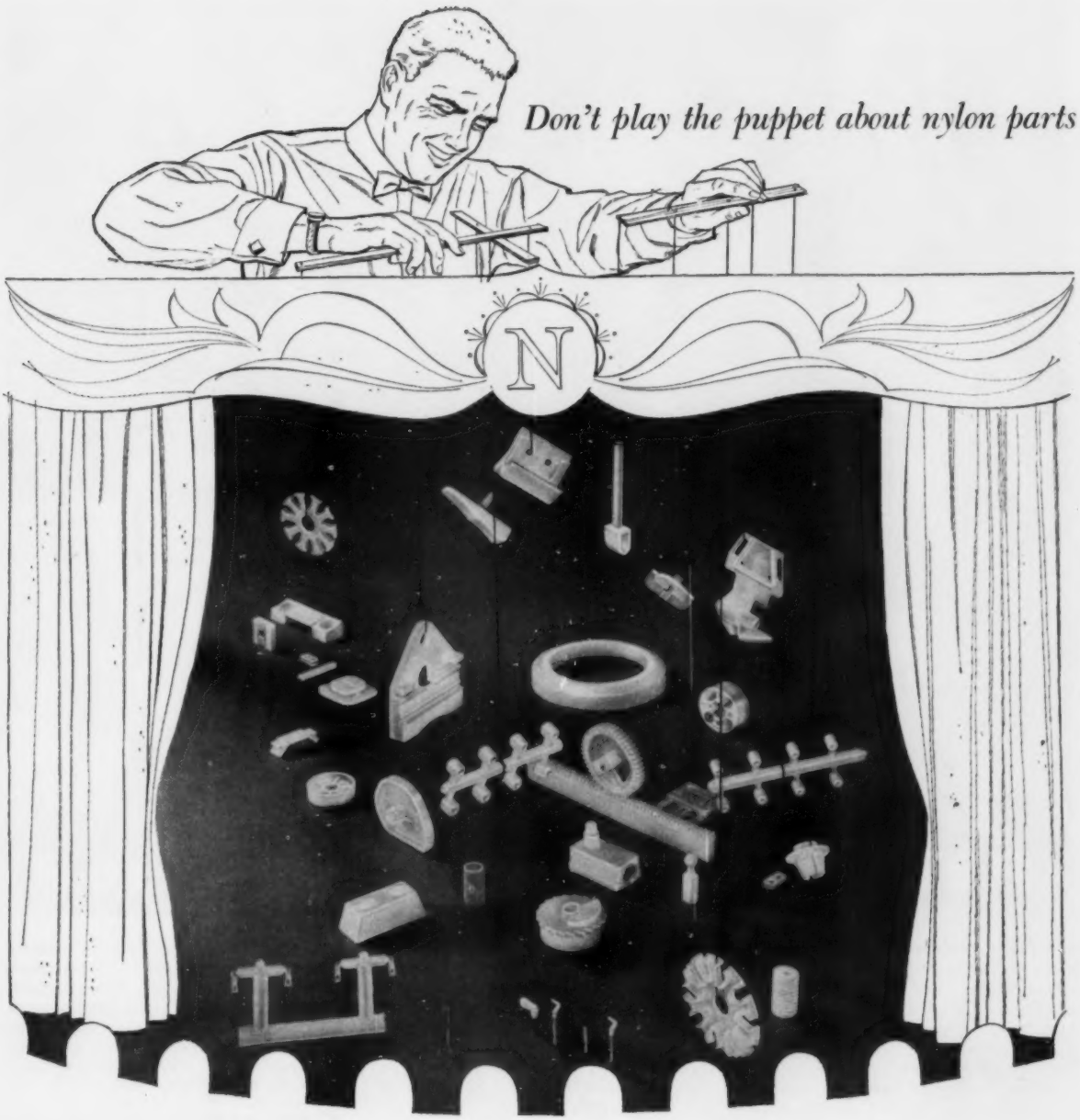

NOSCO "CAN DO" KNOWS NYLON MOLDING

Don't be misled by assuming that just any injection molder can mold nylon. It's an art and requires much skill and experience. Apply this 5-point test to qualify your potential nylon molders:

1. Do you know how to design molds to compensate for temperamental nylon shrinkage?

2. Does your gating control the behavior of nylon—for uniform fill, for optimum physical properties, for minimum waste of this costly material?

3. Do you have specialized machinery for molding nylon? Non-drool nozzles?

4. Do your heating cylinders provide sufficient stages for complete plasticizing without scorching?

5. Do you normalize after molding?

The one molder who can answer all of these questions with an emphatic "yes" is NOSCO—with more than 12 years of "can do" nylon molding experience.

It will pay you to have Nosco "Can Do" quote on your molded nylon parts. Why not write?

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A Leading Molder Reports —

"A wider plasticizing range and ease of processing are big advantages of Spencer Nylon," reports Cliff Hutchison (center) of Molding Jobbers, Inc. Unique molding problem solved by Spencer Nylon is discussed above by Mr. Hutchison and John Beavens (left) and Byron Carlson (right) of Scott-Atwater.

"Spencer Nylon outperforms other nylons in gear application"

Read how Spencer Nylon 401 ran as high as 90 ft. lbs. in a torque load test requiring 55 to 60 ft. lbs.:

A molding crisis was solved recently when Molding Jobbers, Inc. of Minneapolis took advantage of the special benefits available in new Spencer Nylon.

The story began when Scott-Atwater, makers of outboard motors, designed a new type of gear box involving a remote control gear sector. The use of nylon gears was suggested by Molding Jobbers since nylon is largely self-lubricating, corrosion resistant, and about 20% cheaper than cast aluminum in this application. But the problem was to find a nylon that would stand up under the severe strain and stress to which the gears are subjected.

The first nylon tested failed under tension. Then Spencer Nylon 401 was tested. It was found in a torque load test that Spencer Nylon out performed the other nylons as well as other thermoplastics. In fact, Spencer 401 ran as high as 90 ft. lbs. in a test requiring 55 to 60 ft. lbs. But that's not all:

Other advantages of Spencer Nylon 401 were found by Molding Jobbers. A higher melt viscosity and a broad molding temperature range assured good flow properties, proper cavity fill and ease of molding control.

In addition, Molding Jobbers have found that because of the low moisture content in packaged Spencer Nylon, the old problem of excessive moisture pick-up by the granules when exposed in the hopper was solved. The smaller, more uniform granules of Spencer Nylon 401 give constant feed and improved prepacking and plasticizing.

It's easy to see why Cliff Hutchison, president of Molding Jobbers, is now switching other items in his line to Spencer Nylon. Perhaps there is a place for Spencer Nylon in *your* operation. Spencer resins are designed for a wide variety of processing techniques and applications. For more information, write: Spencer Nylon, Spencer Chemical Company, Kansas City 6, Missouri.

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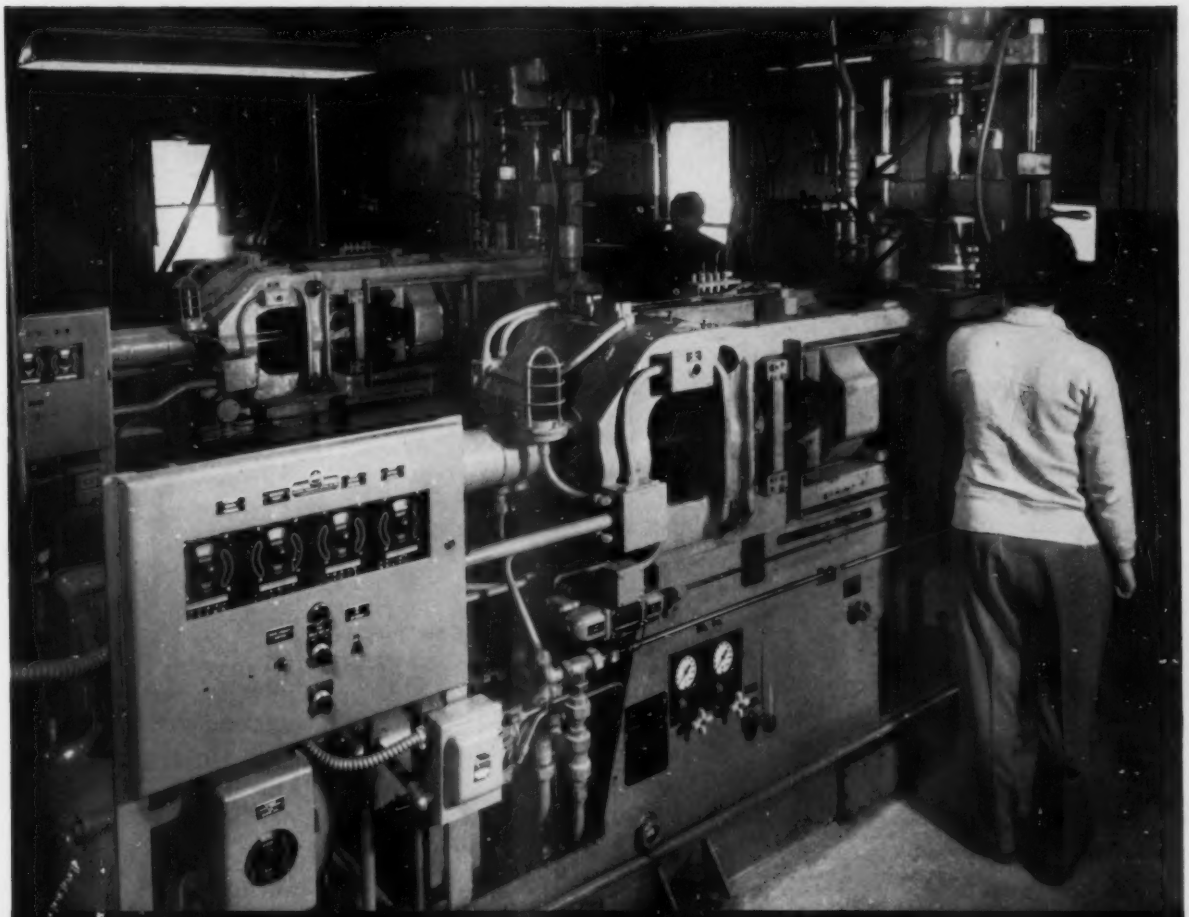


5 oz. of VINYL from a 4 oz. LESTER

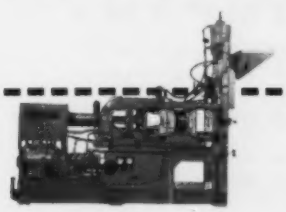
Despite the fact that vinyl is a "derating," heat-sensitive material, they're doing an exceptional job of molding it on a 4 oz. Lester at Draudt Engineering Company (soon to be incorporated under a new name) in Cleveland. The parts shown here are vacuum cleaner hose connectors, a Dreco proprietary item. The 4-cavity shot, including the sprue and runners, weighs a hair over 5 ounces.

Don Draudt, Gen. Mgr., says, "We could hardly believe our eyes when we tested this mold on the 4 oz. Lester – good parts right from the start!

Two important features of the Lester give it the margin of ability to do this job:

1. The unique Lester INTERNALLY HEATED vertical injection cylinder provides for ample plasticizing capacity.
2. The superbly rigid, one-piece cast alloy frame provides an unvaryingly dependable clamp — even for oversize shots. And remember the clamping tonnage rating of every Lester is certified by an independent consulting engineer.

If you're looking for dependable, trouble-free molding, check the performance of Lester machines—in 4, 8, 12, 20 and 60 ounce capacities.



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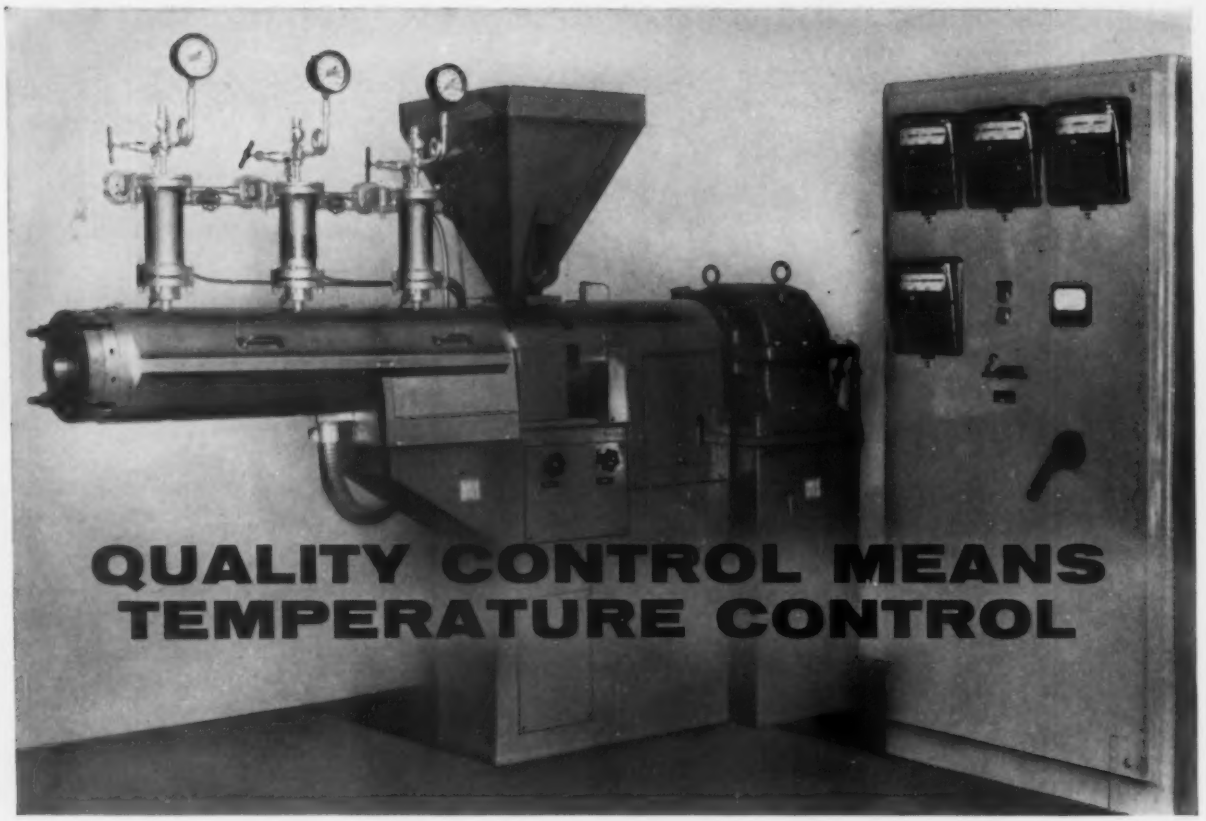

Egan Extruder With "Willert Temperature Control System" Automatically Eliminates Temperature Variations

Heating the plastic material in the extruder cylinder, whether by conduction, induction, or friction, is no problem — assuming the designer has provided sufficient heating capacity and a properly designed screw.

However, provision for efficient dissipation of excessive heat is essential to make any temperature control system complete.

The Willert System is the ultimate in complete control! Excessive heat is removed automatically without moving parts, and without any manual operation of valves or switches by the operator. As a result, closer tolerance extrusions are produced easier and faster.

The Egan Extruder shown above, complete with "Willert Temperature Control System," is available in sizes from 2" through 10". It incorporates standard Egan features such as: herringbone gears, separate heavy duty thrust bearing assembly, complete control panel, wiring, piping, hinged covers for easy access to thermocouples, hopper, screw speed tachometer, and ammeter. Additional features are available.

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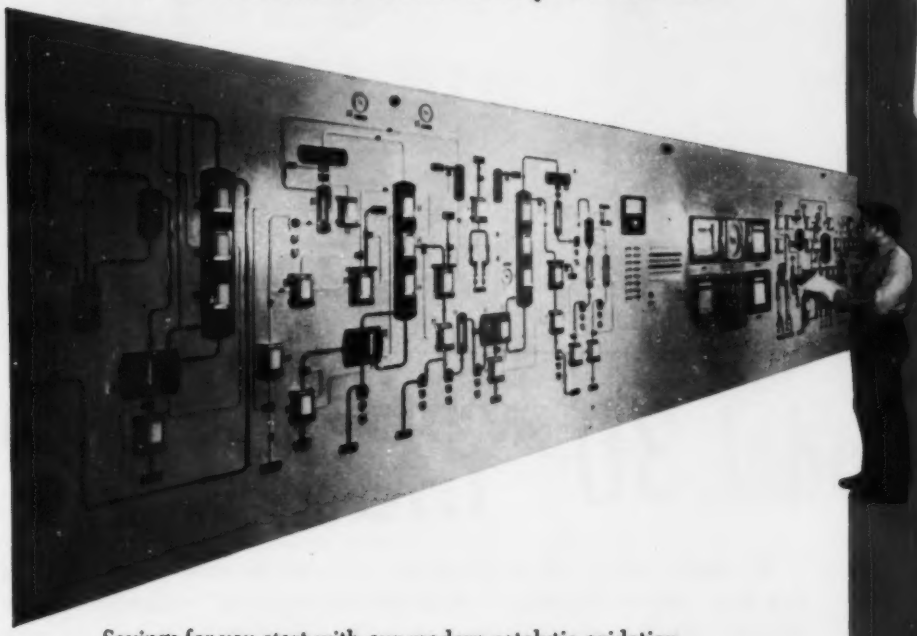

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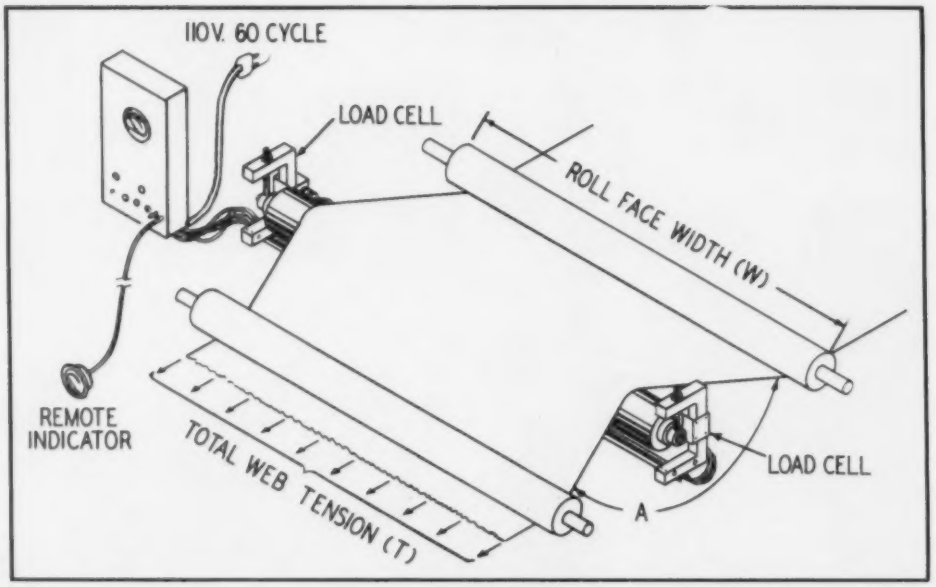
Where web tension is critical . . .



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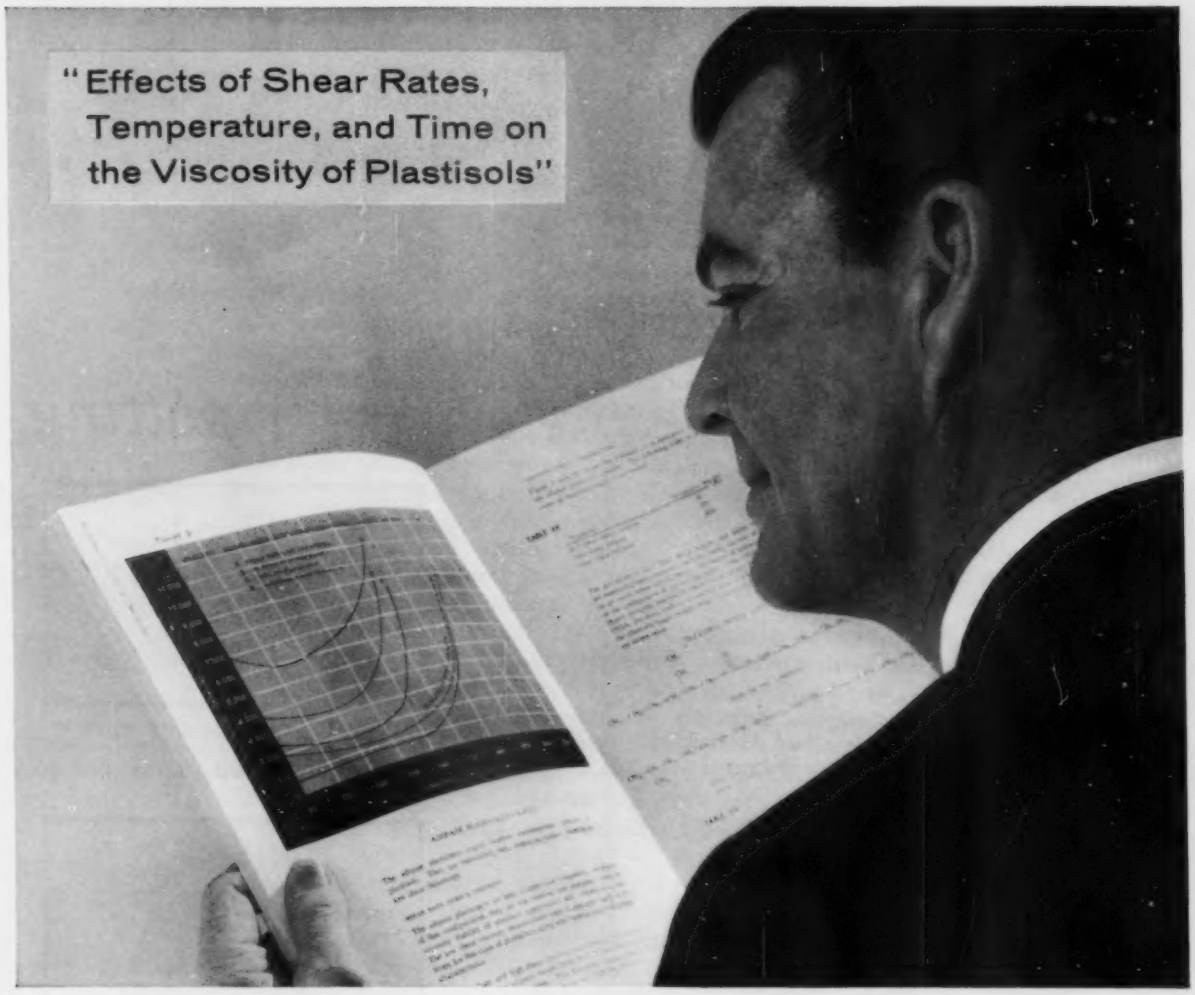

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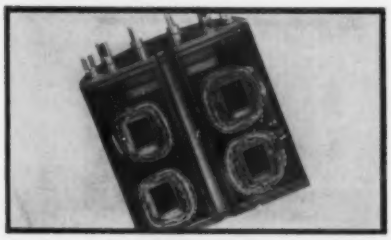

Sections of magnetic amplifier coils, when embedded in Epon resin, have exceptional resistance to solvents and chemicals

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SHELL

The Plastiscope

JUNE 1958

News and interpretations of the news

By R. L. Van Boskirk

Section 1

Polyethylene price changes. Keeping up with price changes in polyethylene requires constant alertness. They come fast and furiously because of the growing pains of a fast-growing product but will eventually settle down to a pattern. In the meantime, a purchaser must watch price announcements with an eagle eye.

The price ball was first set to bouncing last month by Du Pont when two intermediate resins, Alathon 34 and 37, were lowered to 37¢/lb. from 39 cents. When introduced two years ago, the price was 42 cents. Alathon 34 is designed for film and bottles; Alathon 37 is for general-purpose molding. Alathon 31, another intermediate, was reduced 2¢ to 39¢/lb. Designed for thermoforming sheets, it has a low melt index of 0.6, high stiffness and gloss, and resists sagging. All three resins have a density of 0.930.

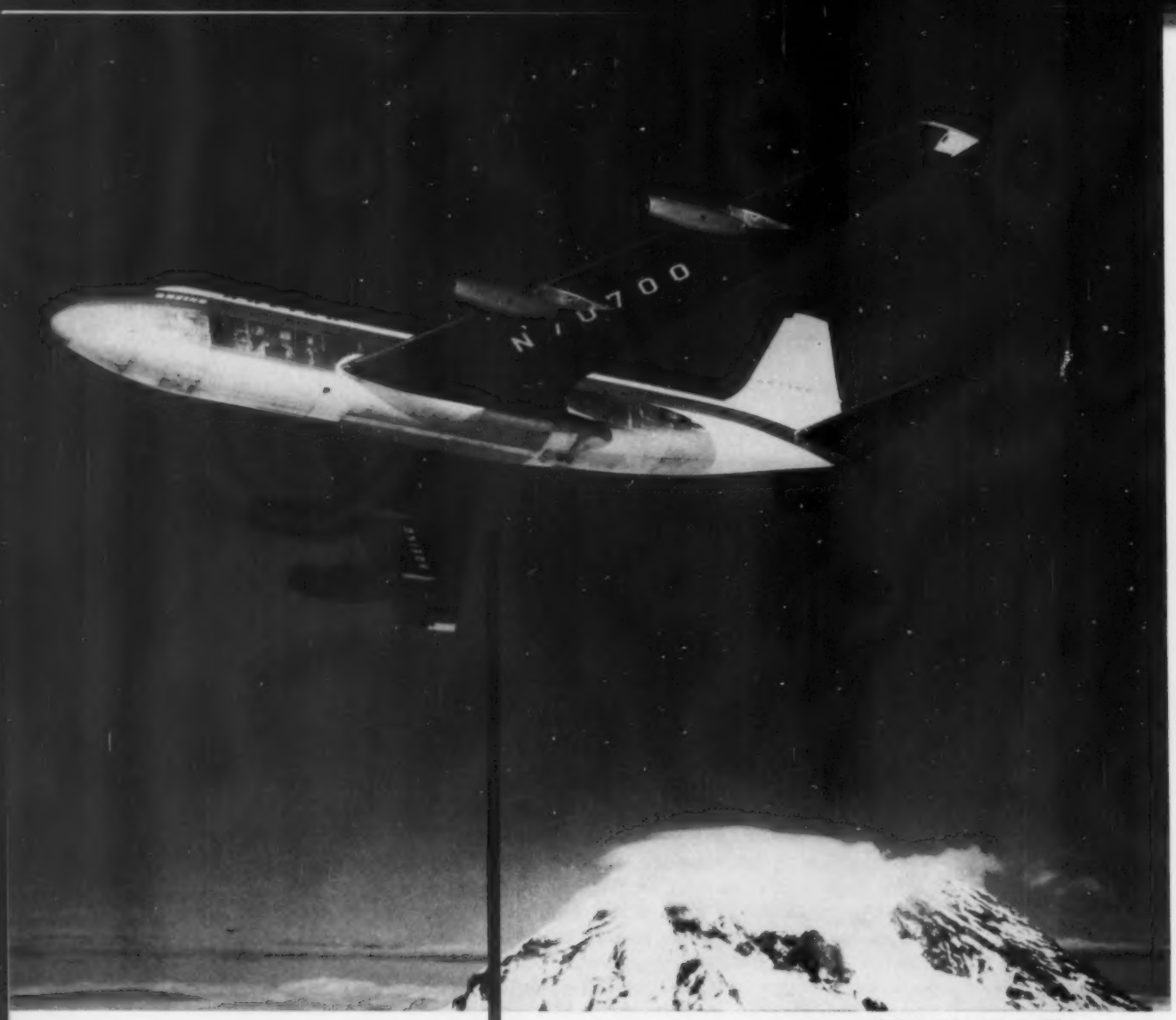
At the same time, Du Pont announced a raise in the price of Alathon 18, a 0.915-density resin with a high melt index, used for molding large houseware items. Just a few months ago, this particular grade of resin was lowered from 35 to 32½¢ by Eastman Chemical to counteract a price disturbance in high-melt-index and off-grade resins. Some of the other producers, including Du Pont, brought out a new resin to meet that challenge. But now they have followed the Du Pont price lead and, as far as can be ascertained, all resins of this particular type that were 32½¢ are now back up to 35 cents.

An interesting change in the new Spencer price list, drawn up to meet the price situation, was the addition of three new film grade resins: 1105 with a density of 0.917 and melt index of 2, with a claimed balance of strength and ease of extrusion; 2476 and 2477 with a density of 0.925 and melt indexes of 4 and 8. The first is for strength and flexibility, the other two are "garment bag resins" with good draw-down and clarity. Prices of the three new resins are 35 cents. It should also be noted that Spencer's highest-density intermediate resin, 0.935, remains at 42 cents.

New catalyst system for ethylene. A catalyst for polymerizing ethylene, recently announced by Bakelite Div., Union Carbide, is completely soluble in hydrocarbon diluents. The significance of the discovery is that a readily soluble catalyst makes it easier to remove every trace of that catalyst in the polymer. There have been various complaints about the ill effects of even minute quantities of catalyst left in the polymer and about the difficulty of getting it all out in some of the low-pressure polymerization systems.

A system of tetraphenyl tin and aluminum bromide forms the new

*Reg. U.S. Pat. Off.



Boeing's sleek, swept-wing 707

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The Plastiscope

(*Continued from page* 39)

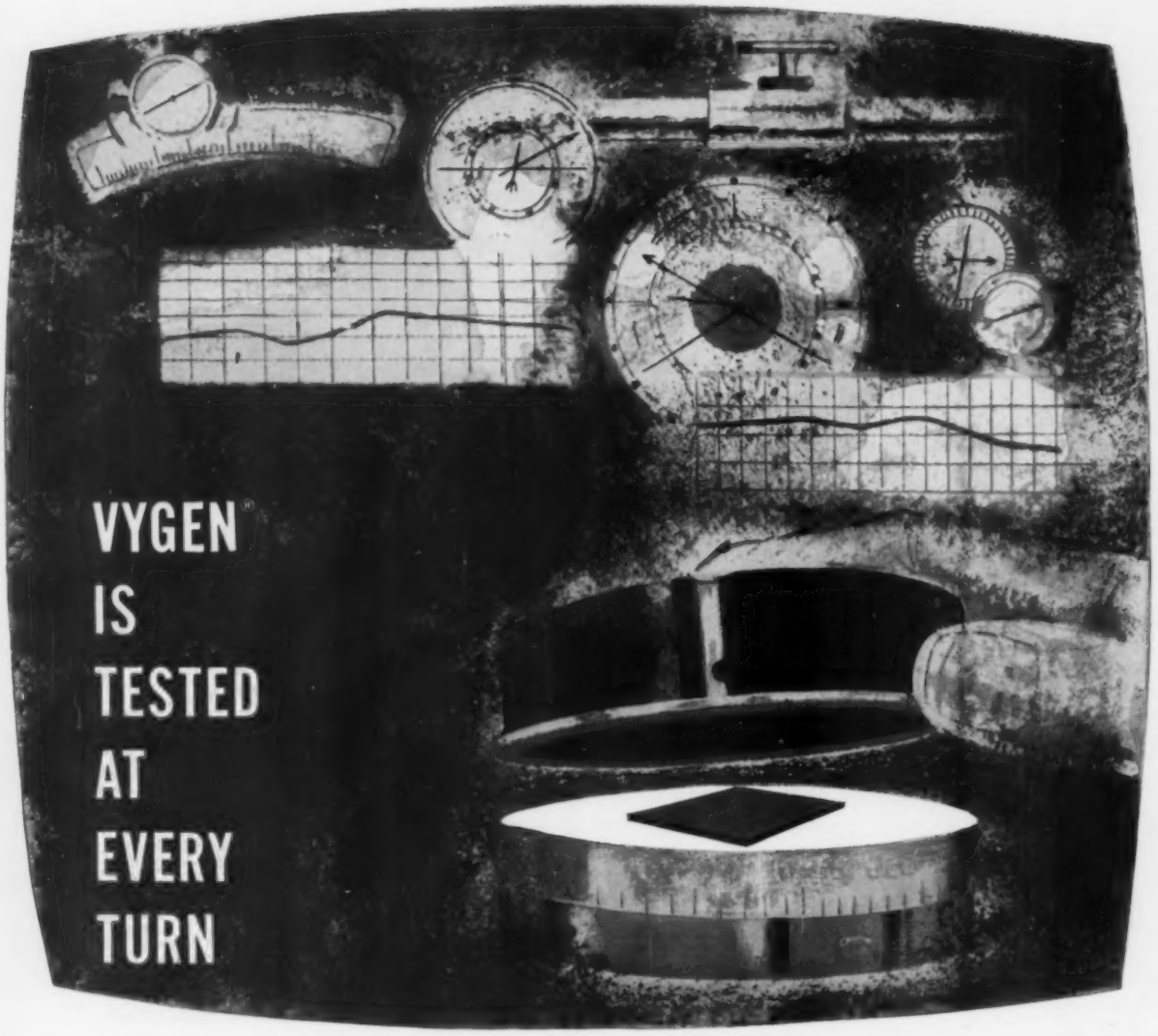
catalyst, but the unique aspect is that vanadium compounds present in the aluminum bromide, generally considered as impurities, are an essential element in this catalyst system. No immediate commercialization of the development is expected, but the discovery creates a new body of information on how to produce high-density polyethylene.

These new ethylene polymers are processable despite molecular weights greater than 65,000—some as high as 125,000; the average for today's processable polyethylenes is generally in the 5000 to 30,000 range. Density of the new material is around 0.960 compared with about 0.950 for Ziegler and 0.960 for Phillips, but, of course, it is possible to vary these densities. The molecular structure is linear and has a crystalline melting point of 137° C. An extremely narrow molecular weight distribution reportedly makes it possible to construct more specific properties within the polymer. The melt index is generally lower than 0.05 in contrast to commercial high- and low-polyethylenes that have melt indices of 0.5 to 20. The lower the index, the harder the resin. Notable properties are said to be improved toughness, lower brittle temperature, and resistance to environmental stress cracking.

Higher-density polyethylene steps up plastic bottle volume. John H. Breck, Inc., Springfield, Mass., is now packaging Banish shampoo in a bottle made from low-pressure-produced, high-density polyethylene by Plax Corp., using Hercules' Hi-fax resin. This announcement means a broadening of the market for polyethylene bottles, jars, and tubes by an unpredictably vast degree from the estimated 15 to 18 million lb. used in 1957. For the chances of polyethylene moving in on the 20-billion-unit glass bottle market, see what a glass man says on p. 238.

Reasons for the expected increase include: containers molded of the new resins are less permeable and will increase shelf life of the contained product; they are crack resistant; they can be offset printed; surface and color are more glossy; thin walls can be safely employed; and light weight and virtual unbreakability will reduce shipping costs. Many of these properties are also obtainable from conventional polyethylene which will continue to grow in volume. However, such advantages as permeation resistance and surface gloss will make the newer material more acceptable in many markets. A Hercules spokesman says that a blown Hi-fax container can be designed to weigh only three-fourths as much as a conventional polyethylene container, one-third as much as a metal unit, and one-eighth as much as a glass bottle.

New series of Marlex polyethylenes. Easier processability, improved stress cracking resistance, much less warp, but about the same stiffness as the original Marlex are the claims made for a newly developed member of the Marlex family. Phillips has not made known the density of the new material, but the melt index, 5, is the same as for the older Marlex. However, the new material has 25% more flow and 25% improved processability. The new Marlex is expected to be particularly adaptable to large moldings and the molder will be able to produce a rigid product from an easy-flow material. (*To page* 43)



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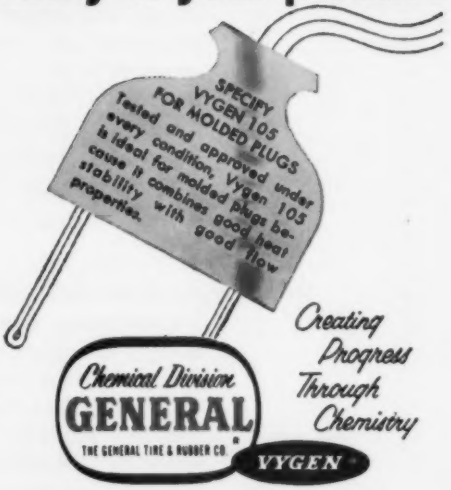
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The Plastiscope

(Continued from page 41)

This same easy flow, with maintained stiffness, makes the new material desirable for bottles, with less chance of stress cracking than with previous formulations. It is also claimed that the new material gives film of improved clarity. It is further suggested for insulation on wire, but is not yet ready for a jacketing material.

Phillips spokesmen insist that the new materials are superior in load-bearing characteristics to other rigid polyethylenes and state that a filament spun from one of the formulations would hold a load of 20,000 p.s.i. for 2000 hr. before breaking.

Polyethylene-carbon black composition. A joint announcement by Hercules and Godfrey L. Cabot, Inc. states that the two have undertaken a joint development on the chemical cross-linking of polyethylene and carbon black compounds in which the key factors are Hercules' "Di-Cup" dicumyl peroxide and "Sterling MT," Cabot's thermal carbon black. The cross-linking has much the same effect as the use of carbon black with rubber in tires. It gives improved strength, higher resistance to heat, and reduced environmental stress cracking. The advantages are even greater when using high-density polyethylene than with conventional polyethylene.

On March 11, Hercules was issued a composition-of-matter patent on this material containing polyethylene and a peroxide such as Di-Cup either in the presence of a filler such as carbon black or other fillers. The result is a compound that doesn't cross-link during extrusion and thus yields a smooth, even coating. The cross-linking takes place after extrusion on equipment that is commonly used in the rubber industry.

The first big use of this polyethylene-carbon black material will probably be for wire coating where it gives both a jacket (like rubber) and the insulation properties of polyethylene. Generally, it is necessary to have both a sheath and a jacket. Wire coaters will be able to use their present continuous vulcanizing equipment for the new material, will have a less costly coating material since carbon black is only 4 to 6¢/lb., and will have the superior properties mentioned in the first paragraph.

Previous announcements of the Cabot program for this process in MODERN PLASTICS in December and June 1957 reported that this development may also increase the burst strength of polyethylene pipe by 50% and that a combination using 50% of each material is generally employed.

Polypropylene price reduction. A reduction to 56¢/lb. for natural Pro-fax polypropylene from its former price of 65¢ has been announced by Hercules. The base price in colors remains at 65 cents.

Hercules is extremely optimistic about the future for Pro-fax. Officials state that never before has there been such a low-cost comparatively rigid plastic that has all the better thermoplastic properties, plus higher heat resistance. The company has added two new formulations. One is a general-purpose material with improved color to make it easier for color matching; another is a heat-resistant formula that has withstood a high service temperature of 272° F. for 1500 to 2000 hours.

(To page 45)

NEW Ferro Plastisol Stabilizers Reduce Your Costs!

Ferro Chemical announces the development of two new low-cost plastisol stabilizers with special advantages for you.

Ferro 1701 is a one package stabilizer for pigmented and filled plastisols. It provides good early color retention and excellent long term stability.

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Both of these new Ferro Plastisol Stabilizers give you low viscosity, low viscosity build-up and excellent air release properties for trouble-free molding, casting or coating.

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The Plastiscope

(*Continued from page* 43)

One of the keys to the new material has been the development of multiple stabilizers so that polypropylene won't depolymerize in the machine; it is said that the material will even withstand a 10- or 15-min. holdup in the molding machine.

Several items are now moving into large volume. Shoe heels is one. Here propylene's higher cost is offset by light weight, and it is claimed that the nails hold more tightly than in other plastics. Laboratory and hospital wares are other good-sized production items.

Products that are now under test and look promising are airplane wheels, pipe fittings, valves, refrigeration parts, shower heads, and business machine housings. Tentative automotive parts are dome lights, steering wheels, arm rests, electrical connectors, and heating louvers.

New rigid vinyl sheet by Seiberling. Some months ago, this department called attention to a new polyvinyl chloride resin, Pliovic S50, by Goodyear, which could be used for production of rigid vinyl sheet. According to Goodyear, S50 will give approximately the same stiffness and high heat distortion typical of straight PVC resins, yet can be processed with the same ease normally associated only with copolymer vinyl resins.

Seiberling Rubber Co. now announces that a new sheet, Seilon TTT, is being produced from S50 at the company's Newcomerstown, Ohio, plant. The three "Ts" represent temperature resistance, toughness, and tear strength. Force required to initiate tear is about 900 lb./inch. The sheet will not support combustion and is said to contain no modifiers that exude or migrate.

Banbury mixing in tandem with a mixing mill is employed in production to assure uniformity. Heat and light stability inherent in the resin assure good color retention. Sheet leaving the calender has a matte surface but can be embossed for special finishes.

Calendered sheet is available in gages of 0.010 to 0.030 in. and in widths up to 60 in.; the thicker sheets, normally prepared by lamination, are available in thicknesses up to 1 in. and sizes up to 4 by 8 feet. A single 4- by 8-ft. sheet 1-in. thick weighs nearly 250 pounds. The material can be printed by offset or silkscreen and good color registration can be maintained even when sheets are printed flat and subsequently thermoformed. It is being promoted especially for thermoformed tote boxes, luggage and cases, signs, relief maps, fume hoods, and ducts.

Seiberling's polypropylene sheets. Another important addition to the Seiberling line is extruded polypropylene sheets up through ¼ in. thick and in 48-in. widths. Tradename is Seilon PRO. Seiberling is the first reported producer of polypropylene sheet, which is suggested for tank liners, exhaust ducts, and fume hoods where metal has proved unsatisfactory.

Extruded rigid vinyl sheeting. A 52-in. wide sheet of rigid unplasticized vinyl chloride, 130 mils thick (a little over ⅛ in.), with a tolerance of ±4 mils, is now being extruded in continuous lengths at the National Rubber Machinery Co. laboratory in Akron, Ohio, according to a joint announcement

The Plastiscope

(*Continued from page* 45)

by NRM and B. F. Goodrich Chemical Co. The resin used is Goodrich 8700A unplasticized resin, but plasticized vinyl as well as vinyl copolymers can also be extruded on this equipment. Up to now, the material has been extruded at a standard rate of around 130 lb./hr. on a 3½-in. machine, but it is believed that the rate can be increased to 180 pounds.

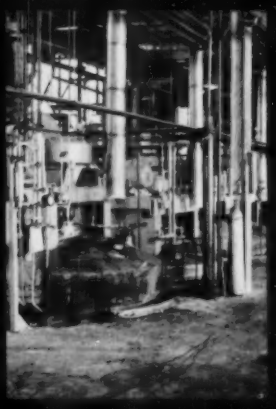
The new extrusion set-up was made possible through the development by NRM of a new flat type sheet die and is expected to reduce costs of producing unplasticized, heavy-gage vinyl sheeting. This is claimed to be the first successful extrusion of unplasticized vinyl in wide widths at such a heavy gage. Heretofore, thick sheets were generally produced by laminating several layers of thin-gage material. Rigid vinyl sheet of this type is used for such products as tanks, ductwork, tank lining, refrigerator door lining, and other items involving thermoforming.

Penton may soon be in commercial production. Another new plastic by Hercules that is reportedly about ready for commercial production is Penton, a thermoplastic polymer based on pentaerythritol. It was announced a couple of years ago but has since been in a development and evaluation stage until its worth could be firmly established. Penton is said to possess a unique combination of electrical and chemical resistance properties and can be readily molded in ordinary injection and extrusion equipment. At its present development price of $6/lb., it will serve primarily in markets where plastics have not been used before or where hard-to-mold materials have previously been required.

Among Penton molded items now in use is a ¾-in. valve for chemical plants that sells for $28 compared with a stainless steel valve at $70 or more. The new Boeing jets will reportedly use 300 Penton ½-in. valves for water lines; they are lighter in weight than metal and are flame resistant. Penton valves will withstand service temperatures of 250 to 300° F.

1957 sales history for Chicago Molded Products. The interesting annual statement of Chicago Molded Products gives strong evidence of what is happening in the competitive struggle now going on between custom and proprietary molders. In 1957, the company's custom molding division sales declined 16%, while Campco Div. (extruded sheet) sales increased 53% and the dinnerware division sales increased 339 percent. Lower sales in custom molding resulted from competitive pressure that necessitated lower selling prices and from decreased activity in hard goods lines that use plastics parts. Increased sales in Campco were recently developed products—tripolymer styrene, cellulose acetate, and butyrate sheet and film. Dinnerware sales gains came from growth in the company's own line of melamine dinnerware, more distributors, and a tie-up with Fostoria Glass Co. for production of its dinnerware line. Total sales of Chicago Molded Products Corp. were $8,793,052 in 1957 compared with $9,223,649 in 1956.

For additional and more detailed news see Section 2, starting on p. 238.



PARAPLEX / *polymeric* • **MONOPLEX** / *monomeric*

plasticizers

FROM ROHM & HAAS COMPANY

Compounders of vinyl products can choose from a variety of Rohm & Haas plasticizers ranging from monomeric esters—MONOPLEX plasticizers—to complex, high molecular weight polymers—PARAPLEX plasticizers. Used alone, or in combination, Rohm & Haas plasticizers offer vinyl compounders distinctive processing and performance benefits.

Whether your product demands plasticizers with resistance to migration, stability against heat or light, very low volatility, flexibility at low temperatures, resistance to extraction by a variety of solvents, both organic and aqueous, or good electrical properties, Rohm & Haas plasticizers can do the job effectively and economically.

Whether you are making floor tile or baby pants, high frequency cable jacketing or garden hose . . .

here's what you should know about **PARAPLEX** and **MONOPLEX** plasticizers →

PARAPLEX *polymeric plasticizers*

Paraplex G-25

- ***exceptional permanence***
- ***excellent compatibility***
- ***high resistance to ultra-violet light***

Paraplex G-25 is a high molecular weight plasticizer which imparts exceptional permanence. Properly stabilized vinyl compounds which contain Paraplex G-25 plasticizer are outstanding in durability. Paraplex G-25 has excellent resistance to extraction by gasoline, oil, water, soap and detergents, as well as freedom from migration in contact with lacquer, alkyd and varnish finishes. Compatibility with vinyl resins is excellent. Original physical properties are retained even after prolonged service at elevated temperatures.

Typical uses include: high grade upholstery sheeting and coated fabric, refrigerator gaskets, surgical tapes; insulation resistant to high temperature, coaxial cable, window channeling, electrical tapes.

Paraplex G-40

- ***high resistance to migration into rubber***
- ***high resistance to extraction by oil***

Paraplex G-40 is a high molecular weight polyester plasticizer which combines permanence of plasticizing action with moderate cost. Compounds in which Paraplex G-40 is used show low losses due to volatility, resistance to extraction by aliphatic and aromatic hydrocarbons, and high resistance to migration into rubber and rubber-based materials.

Typical uses include: industrial hose and tubing, industrial and domestic flooring, shoe liners and counters, electrical tapes and industrial aprons.

Paraplex G-41

In resistance to extraction by hydrocarbons and to migration into rubber, Paraplex G-41 is on an equal footing with Paraplex G-40. However, Paraplex G-41 is superior in compatibility at high plasticizer levels and after long exposure to humid conditions, in plasticizing efficiency, ease of processing, low-temperature properties, and resistance to extraction by soapy water.

Paraplex G-50

- ***good processing characteristics***
- ***very good over-all permanence***

Paraplex G-50 is a general-purpose polymeric plasticizer similar to monomeric plasticizers in its handling and processing characteristics. It is notably superior to dioctyl phthalate in resistance to extraction by oils and hydrocarbons, freedom from volatility, and resistance to migration into lacquers, rubber, and typical baked finishes. Vinyl compounds containing Paraplex G-50 are very stable, as evidenced by the retention of original properties after prolonged aging at high temperatures.

Typical uses include: insulation resistant to high temperature, upholstery sheeting, coated fabric, flooring, refrigerator gaskets, window channeling, surgical tapes, electrical tapes, shoe liners and counters, pigment dispersion vehicles, doll compounds.

MONOPLEX *monomeric plasticizers*

Monoplex DOS

(dioctyl sebacate)

- ***outstanding performance at low temperatures***
- ***low volatility***
- ***resistance to extraction by soap and detergent solutions***

Monoplex DOS is an ester-type plasticizer widely used as a standard in vinyl compounds requiring flexibility at low temperature. It also provides low volatility, high plasticizing efficiency and excellent resistance to extraction by water, soaps and detergents. Like other plasticizers which impart low temperature flexibility, Monoplex DOS is susceptible to extraction by hydrocarbons and deficient on migration resistance. It is a very effective plasticizer for organosol and plastisol compounds.

Typical uses include: primary electrical compounds, sheeting and film for use at low temperatures, jacket compounds, strip-coating compounds.

Monoplex S-38

- ***excellent compatibility***
- ***good permanence at low cost***

Monoplex S-38 is a low-cost primary vinyl plasticizer particularly noted for its good permanence properties. It is high in molecular weight and offers definite advantages over dioctyl phthalate. Monoplex S-38 is lower in volatility and better in resistance to extraction by oil and gasoline. Compounds exhibit excellent freedom from tack and exudation. Monoplex S-38 also proves helpful in improving the compatibility of secondary plasticizers.

Typical uses include: low-cost sheeting, flooring, automotive harness tapes, low-cost gasketing, electrical jacketing stocks.

Monoplex S-70

- ***stabilization against effects of heat and light***
- ***good performance at low temperatures***

Monoplex S-70 is designed specifically to impart flexibility at low temperature. It is a very efficient plasticizer with good processing properties and a marked stabilizing effect. It has lower volatility than conventional plasticizers for low temperature applications. The stability imparted by Monoplex S-70 not only permits fast, high-temperature compounding, but also affords savings in stabilizer costs. Organosols and plastisols prepared with Monoplex S-70 are of low viscosity and have excellent viscosity stability.

Typical uses include: garden hose, film and sheeting for use at low temperatures, slush-molding compounds, electrical jacket stocks, automotive insulation.

Paraplex G-54

- ***very good compatibility at high humidity and elevated temperatures***
- ***high resistance to extraction by soapy water and oil***
- ***excellent resistance to marring of polystyrene and baked enamels***

Paraplex G-54 was especially designed to provide freedom from exudation on exposure to high humidity at elevated temperatures. Other noteworthy properties which this plasticizer imparts include resistance to marring of polystyrene, lacquers, and baked enamels; good resilience; outstanding plasticizer efficiency; good electrical properties; resistance to copper corrosion; and resistance to extraction by soapy water, oils, and gasoline. The properties of Paraplex G-54 make it particularly well suited for many applications which require resistance to both aqueous and organic solvents.

Typical uses include: high-temperature electrical insulation, refrigerator gaskets, electrical and surgical tapes, babywear film, hospital sheeting, and upholstery (household and automotive).

Paraplex G-60

- ***excellent resistance to extraction by soap and detergent solutions***
- ***stabilization against heat***
- ***accepted by F. D. A. for food packaging***

Paraplex G-60 is a light-colored, high molecular weight, ester-type plasticizer which provides effective heat and light stabilization in vinyl chloride polymers, nitrocellulose lacquers, and chlorinated rubber compounds. It imparts good flexibility at low temperature, excellent soap and detergent resistance, and low volatility loss. Paraplex G-60 lowers stabilization costs of vinyl compounds and permits high temperature processing.

Typical uses include: general-purpose film, babywear, food packaging and tubing, upholstery sheeting, coated fabric, glove-dipping compounds, flooring.

Paraplex G-61

This plasticizer is generally similar in properties and uses to Paraplex G-60. It is superior in retention of compatibility on long term exposure, has better stability against light, and is more resistant to extraction by oil.

Paraplex G-62

- ***excellent stabilization against effects of heat and light***
- ***good general permanence properties***
- ***good resistance to soap and detergent solutions***
- ***accepted by F. D. A. for food packaging***

Paraplex G-62 is a high molecular weight plasticizer which combines good permanence properties with excellent stabilization against heat and light. It has low volatility, good resistance to extraction by soap and detergent solutions, and high compatibility over a wide range of concentrations and conditions. Permits fast calendering and low stabilization costs, provides uniform color and excellent resistance to embrittlement and discoloration.

Typical uses include: general-purpose film, upholstery sheeting, coated fabric, refrigerator gasket stocks, garden hose, doll compounds, food packaging and tubing, welting, primary insulation, jacket stocks, flooring, insulation resistant to high temperature, window channeling.

Monoplex S-73

- ***excellent low-temperature flexibility***
- ***stabilization against effects of heat and light***
- ***unusually good permanence at moderate cost***

Monoplex S-73 couples excellent low-temperature flexibility with good compatibility and low volatility, and thus offers outstanding performance over a broad temperature range. Its stabilizing effects against degradation by heat and light further extend its fields of use. Relatively low price and low specific gravity result in production economy. This low-viscosity plasticizer is particularly useful in plastisol applications where it imparts exceptional viscosity-stability.

Typical uses include: rear windows for convertible automobiles, transparent automobile seat covers, garden hose, storm-window glazing, slush-molding compounds.

Monoplex S-90

- ***electrical-grade plasticizer***
- ***excellent high-temperature performance***
- ***retention of resistivity after prolonged water exposure***

Because it imparts good retention of physical and electrical properties after heat aging and exposure to water, Monoplex S-90 is an excellent plasticizer for electrical insulation. In addition, this plasticizer provides unusual permanence, resistance to microorganism attack, and freedom from copper corrosion. Its low viscosity and ease of incorporation also make it useful in non-electrical applications. In dispersion compounding, it gives low-viscosity plastisols with very good viscosity-stability.

Typical uses include: high-temperature electrical insulation, dispersion compounding, tapes, gaskets, and coatings for awnings and truck tarpaulins.

Monoplex DCP

(*dicapryl phthalate*)

- ***general-purpose plasticizer***

Monoplex DCP is a general-purpose monomeric plasticizer having performance characteristics, in vinyl resins, virtually identical to those of dioctyl phthalate. While it shows less resistance to extraction by oil and gasoline and lower plasticizing efficiency, Monoplex DCP withstands degradation by heat, light and outdoor exposure slightly better than dioctyl phthalate. In plastisol and organosol compounding, Monoplex DCP provides low viscosity, both initially and upon aging.

Typical uses include: general-purpose replacement for dioctyl phthalate.

coating compounds.

CHECK THIS CHART OF PERFORMANCE PROPERTIES AT 1550 PSI MODULUS

PLASTICIZER GRADE	% Plasticizer to give 1550 psi modulus	Loss by Volatilization	PERCENT EXTRACTION LOSS BY Oil	Gasoline	Soapy Water (90°C.)	Brittle Point (°C.)	Hardness (10 secs.)
PARAPLEX G-25	40.5	0.5	+0.3	0.2	0.2	—14	73
PARAPLEX G-40	45.0	1.2	0.3	0.0	—	+10	76
PARAPLEX G-50	41.0	1.3	3.5	3.5	6.9	—13	72
PARAPLEX G-60	37.5	0.3	7.0	10.5	0.1	—20	73
PARAPLEX G-61	38.0	0.3	5.5	9.8	0.2	—16	73
PARAPLEX G-62	38.5	0.3	4.5	8.5	0.3	—15	73
MONOPLEX DOS (Dioctyl Sebacate)	32.5	4.0	14.5	22.2	0.8	—50	79
MONOPLEX DCP (Dicapryl Phthalate)	37.5	8.0	17.5	22.5	7.5	—25	75
MONOPLEX S-38	38.5	1.5	3.0	12.0	17.4	—11	69
MONOPLEX S-70	32.0	6.5	19.0	20.0	7.2	—50	80
DIOCTYL PHTHALATE[1]	35.0	8.1	9.0	19.0	7.7	—26	74

[1]not offered—included as control value only.

PERFORMANCE PROPERTIES OF 60:40 POLYVINYL CHLORIDE : PLASTICIZER FORMULATIONS CONTAINING RECENTLY-INTRODUCED PLASTICIZERS[2]

PLASTICIZER	Loss by Volatilization	PERCENT EXTRACTION LOSS BY Oil	Gasoline	Soapy Water (90°C.)	Brittle Point (°C.)	Hardness (10 secs.)
PARAPLEX G-41	0.5	+0.07	0.0	3.5	—10	79
PARAPLEX G-54	0.7	1.8	1.9	2.9	—13	72
MONOPLEX S-73	3.3	26.0	33.5	10.0	—54	65
MONOPLEX S-90	1.0	2.2	28.0	0.4	—13	78

[2]an evaluation program to determine the 1550 psi modulus data for these plasticizers is currently in progress.

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Protection against "tramp metal plague" is afforded by the RCA Electronic Metal Detector — a cost-saving inspection device which has been adopted by hundreds of plastics manufacturers and processors, and is rapidly becoming standard equipment for reprocessors.

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Used on strip material traveling at speeds from 15 to 600 feet per minute, with full inspection sensitivity, the RCA Electronic Metal Detector can be installed so that it sounds an alarm and/or stops the traveling material. It can pay for itself quickly through decreased downtime, production savings, longer life of costly machinery. You'll wonder how you ever did without it!

FREE literature on the RCA Electronic Metal Detector for plastics will be sent to you without obligation. Write to RCA Dept. G-75, Building 15-1, Camden, N. J.

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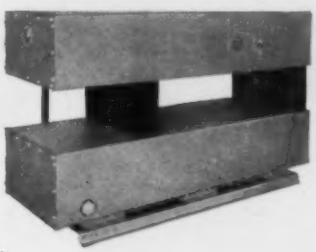

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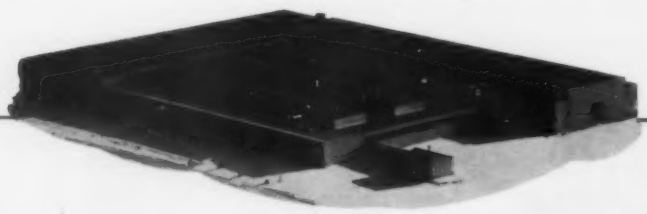

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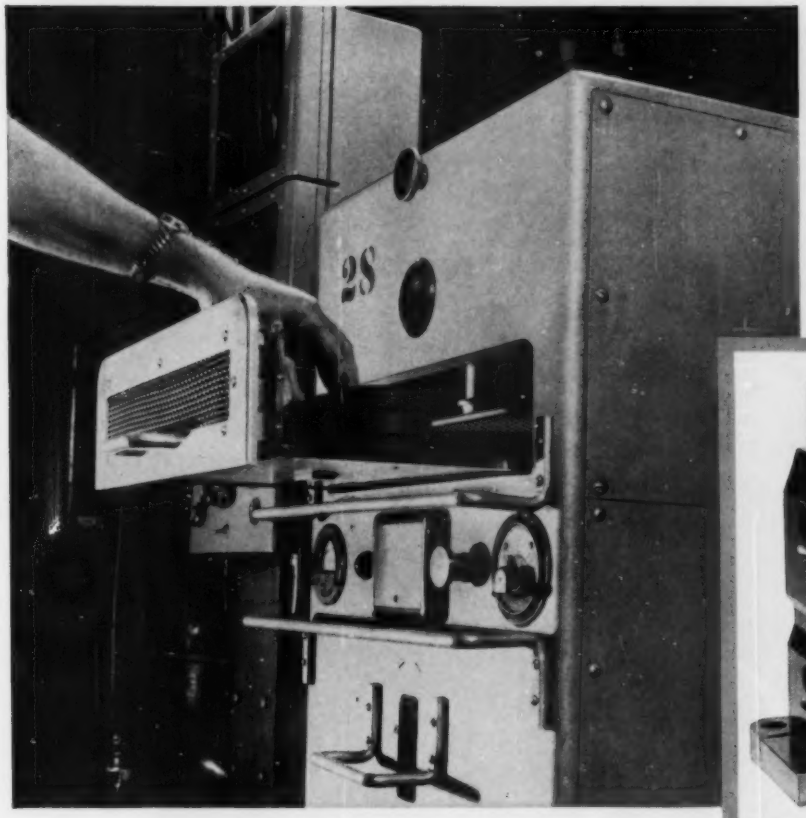
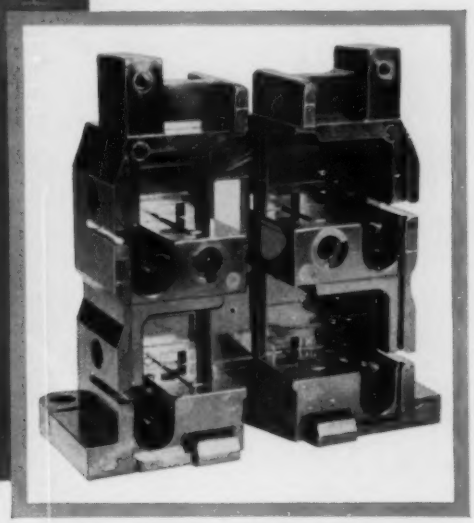
Cutler-Hammer guards quality with fast, uniform heating of preforms

Thermex® Plastic Preheater



Left: A 3 KW THERMEX Dielectric Preheater speeds molding operation, contributes to uniform high quality of base for a Cutler-Hammer A-C Magnetic Starter, shown in inset.



Cutler-Hammer, Inc., Milwaukee, sets exacting standards for plastic components of their Three Star motor controls. Eighteen THERMEX* Dielectric Preheaters help assure uniform, top-quality molding. Output at each station is speeded by precise heating of preforms. The THERMEX Preheating Units handle continuous 3-shift production with unvarying reliability. Time loss and maintenance expense are held to a minimum.

There is a Thermex engineer eager to help *you* upgrade molding operations... to lower the cost of turning out consistently high quality products. Call our nearest office.

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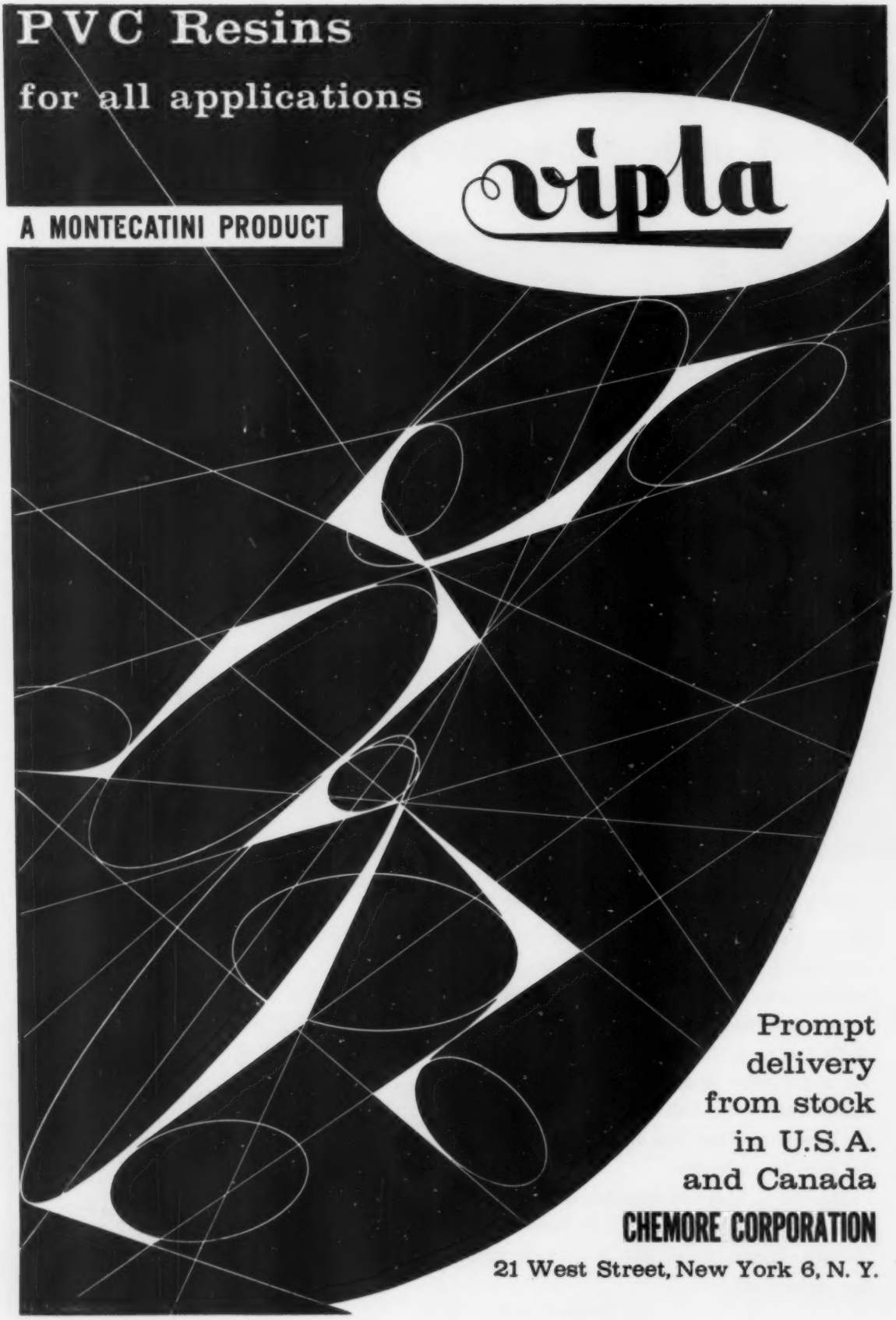

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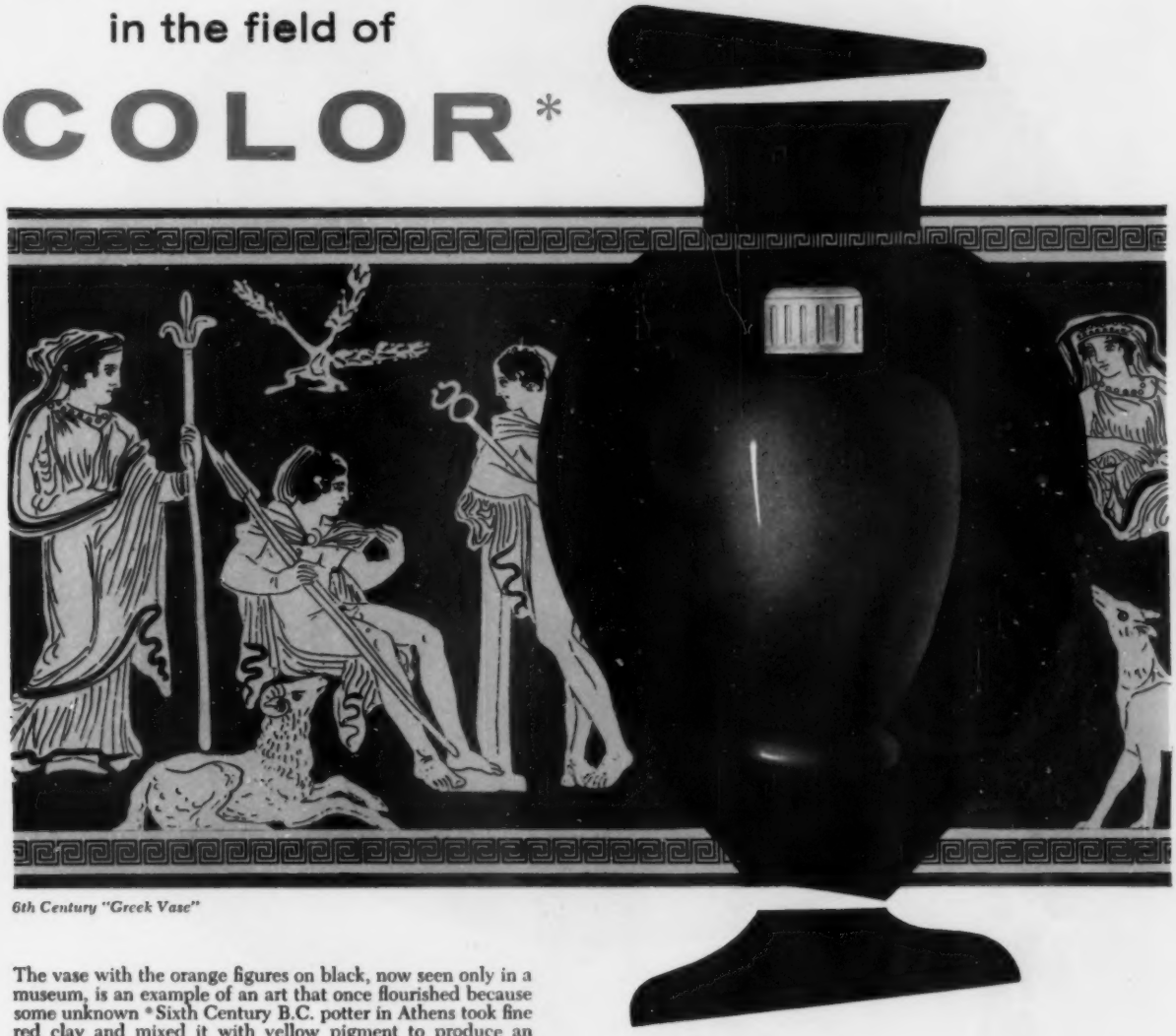

6th Century "Greek Vase"

The vase with the orange figures on black, now seen only in a museum, is an example of an art that once flourished because some unknown *Sixth Century B.C. potter in Athens took fine red clay and mixed it with yellow pigment to produce an entirely new color.

Like that ancient Greek craftsman, WESTCHESTER PLASTICS calls upon its intimate knowledge of color, developed while serving the plastics industry for over ten years, to meet (and even stay a step or two ahead of!) its newest challenges — the new linear polyethylenes, for example. Westchester is proud to be the first to offer a pre-matched color concentrate that does its job without degrading, migrating or leaching, while it gives improved temperature and chemical resistance.

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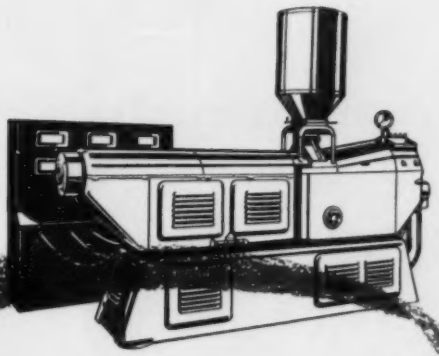
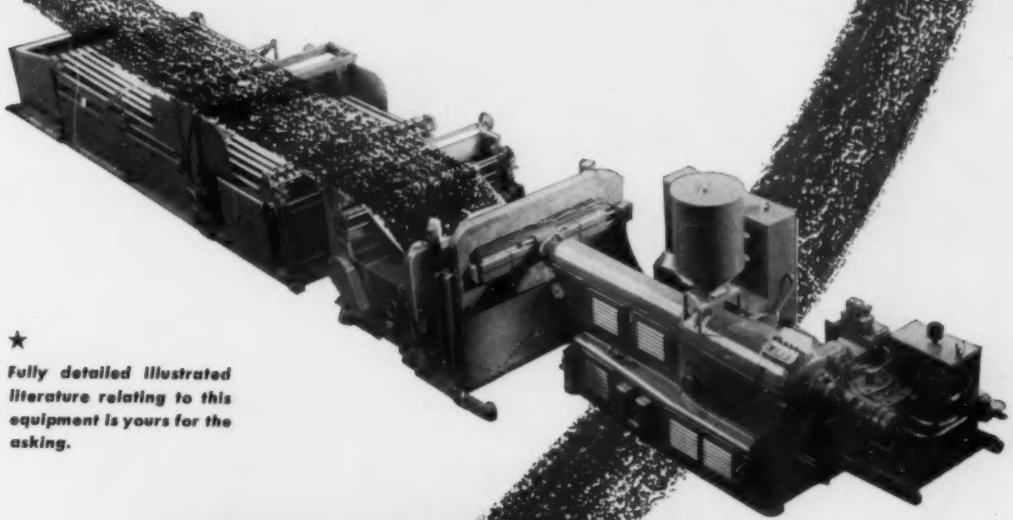
3½ in. single-screw
EXTRUSION MACHINE



Talking about EXTRUSION MACHINES

. . . here is a typical Windsor take-off assembly, as used in modern polystyrene sheet production. Working in conjunction with a 3½ in. single-screw extrusion machine is shown the all-steel welded take-off unit incorporating three super finished hard-chrome faced rollers, with pneumatically operated sizing roller adjustable for sheet thickness. Speed of sheet through take-off controlled by rubber-covered, quick-release pinch rolls. Fully adjustable rotary trimming knives accommodate varying thickness of sheet. Variable speed of take-off has independent or combined control of both sets of rollers. The unit is track moulded, adjustable for height, and available in two ranges:—

To accommodate trimmed sheet up to 36 in. in width.
To accommodate trimmed sheet from 36 in. to 60 in. in width.



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The THERMATIC Series can handle *considerably more horsepower* than other extruders of the same bore size.

The THERMATIC Series can maintain *higher stock screw speeds* than previous models.

The THERMATIC Series has a new, larger THERMA-FIN* system for *precise temperature control* even at maximum production speeds.

The THERMATIC Series is the newest, most versatile Thermoplastic Extruder you can buy!

*Patented

For complete specification and details on the new THERMATIC Series write today to

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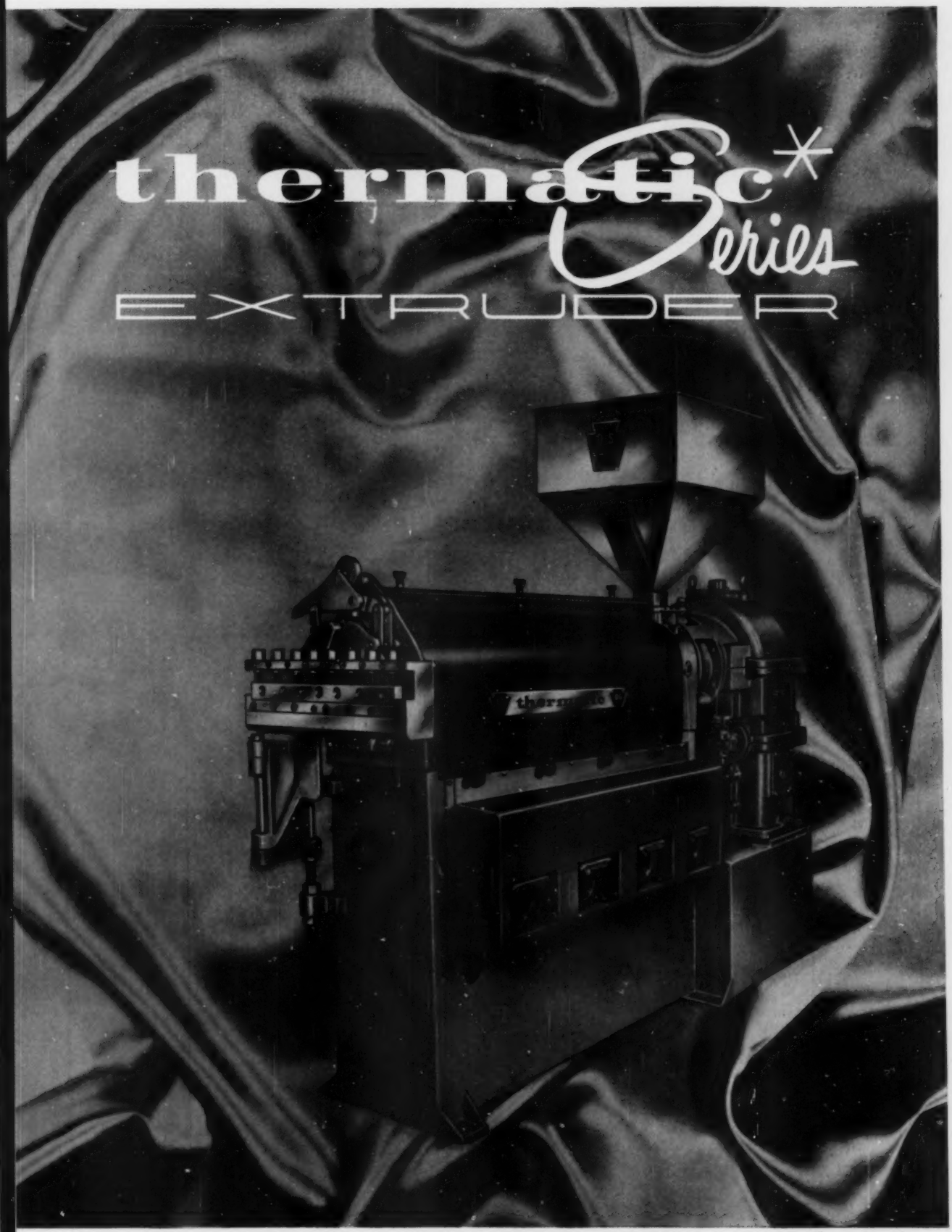
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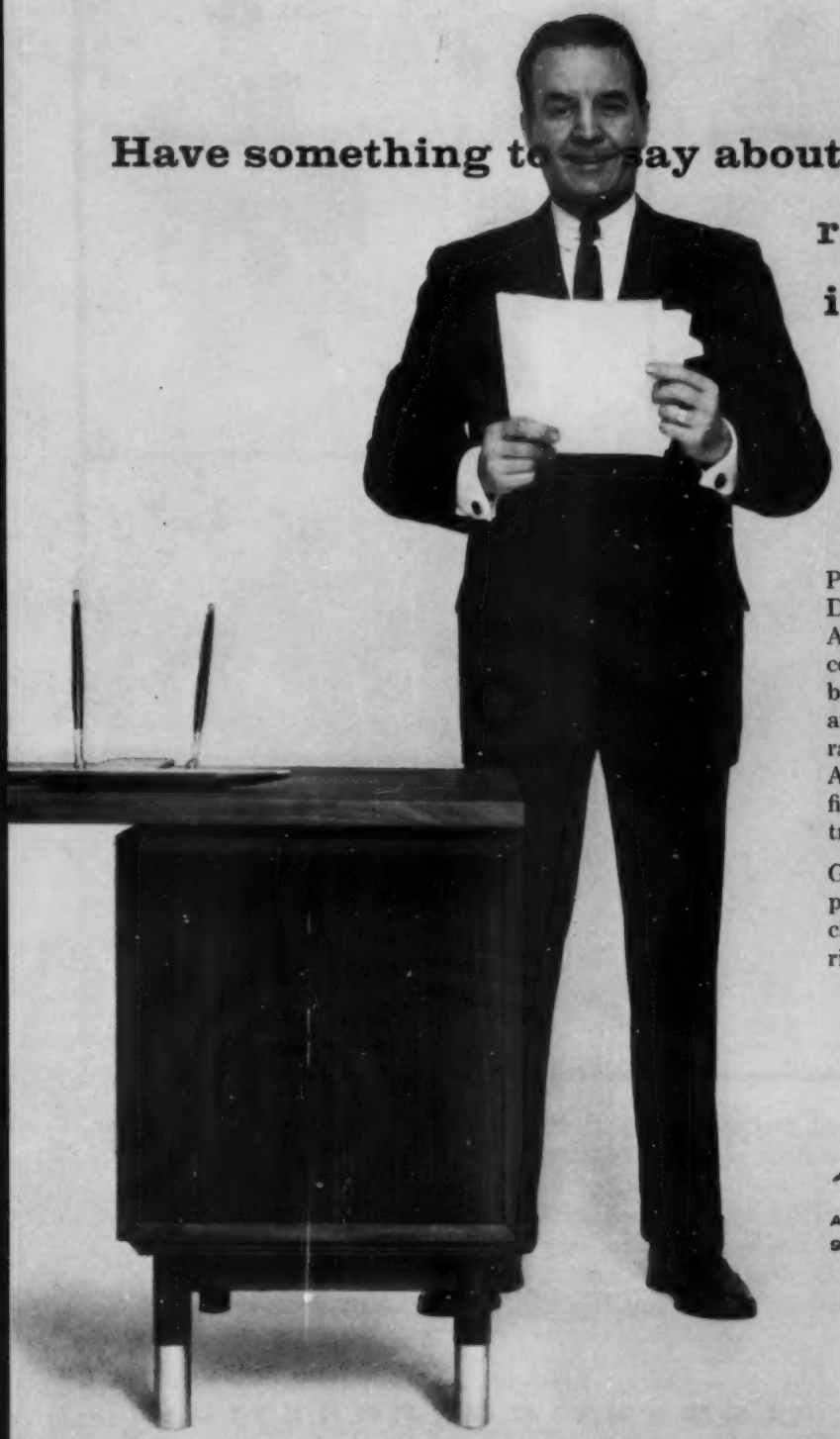

Have something to say about the raw materials used in your plasticizers

Phthalate-type plasticizers—DIOA, DDP, DDA, DIOP—made from Amoco Oxo Alcohols are lighter in color and more stable. This is possible because with these Alcohols, esterifiers are starting with the highest quality raw materials. How come? Because Amoco Oxo Alcohols must meet specifications that are setting a new industry level for minimum ester color.

Getting better finished vinyls and improving processing can result from checking the quality of the raw materials used in plasticizers that you buy.

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Here's why: these leading white pigments lighten and opacify colors, whiten and opacify white stocks, regulate translucency or opacity, and contribute to durability. In addition, they lighten the burden of processing through ease of dispersion and uniformity of all properties. Our Technical Service Department can help you with any pigmentation problem. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities.

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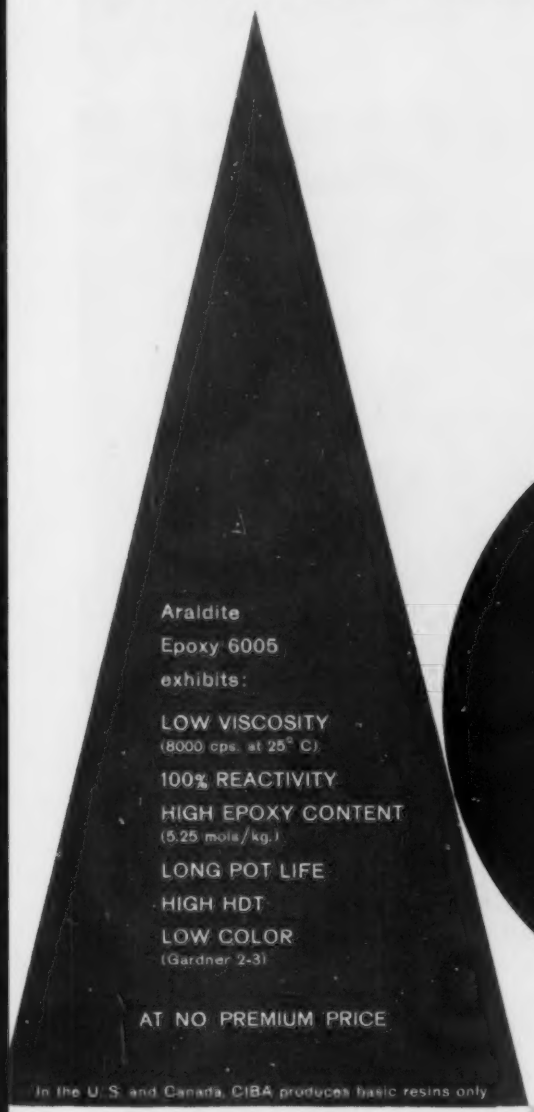

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☐ Please send me complete technical information on Araldite Epoxy 6005.

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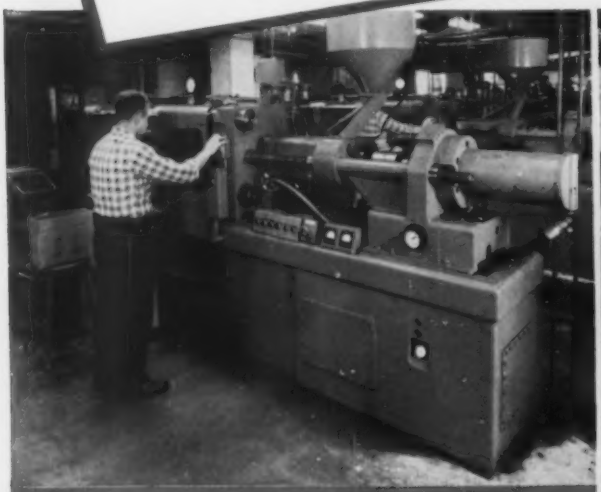
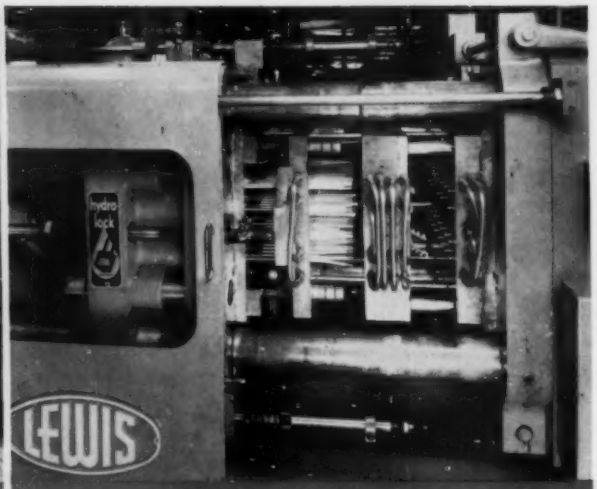
"FIRST IN EPOXIES"

Scripto "WRITES" NEW PRODUCTION RECORDS!



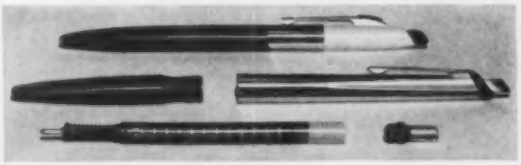
VERSATILE AND DEPENDABLE, these Lewis 6-Ps produce millions of pen and pencil parts annually from low-pressure polyethylene, nylon and butyrate.



LEWIS PRE-PLASTICIZERS CREATE SAVINGS in linear "poly" molding. On this 84-cavity ink tube mold, normal cycles were cut 50% — scrap reduced to less than 2%.

BUTT-LWM

. . . with LEWIS 6-P PRE-PLASTICIZER MACHINES



Scripto pens and pencils are world-famous for quality and performance . . . at competitive prices. This reputation is maintained through diligent cost controls. *For example . . .*

. . . LEWIS 6-P injection machines have increased production and reduced overall costs for many *Scripto* parts. Replacing more expensive 16-ounce machines, they produce superior moldings with minimum scrap.

Scripto, Inc. of Atlanta, Ga., is typical of savings-conscious production molders. They specify LEWIS 6-P machines because of their economy, versatility, performance.

CAPABLE OF MOLDING ALL PLASTICS, including low-pressure linear polyethylenes, the LEWIS 6-P Pre-Plasticizer is a money-saving production machine. It features the exclusive 200-ton "Hydra-Lock" clamp . . . fast, easy set-up . . . intermittent operation without shut-down, burning or flashing . . . mold sizes up to 24" x 14" (or 20" in dia.) . . . quick-release die-lock device for access to nozzle . . . machine tool accuracy and construction.

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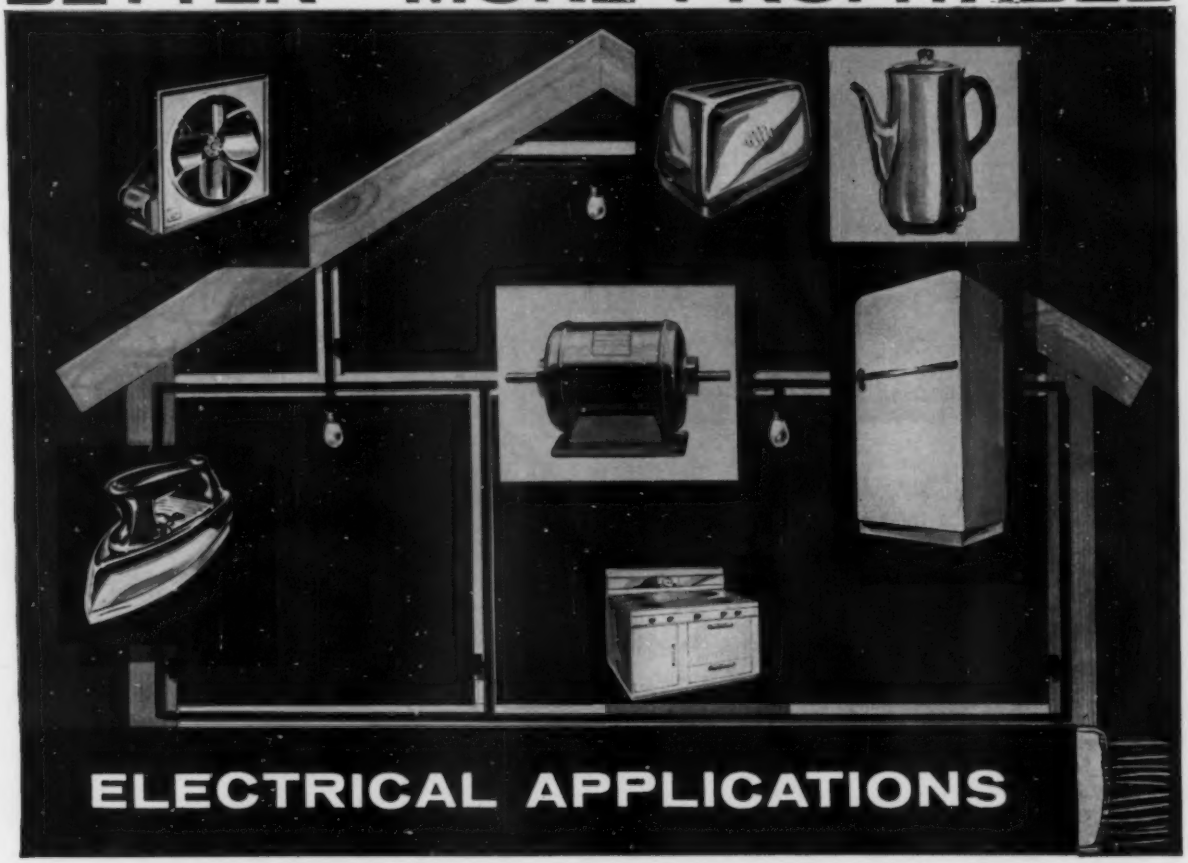
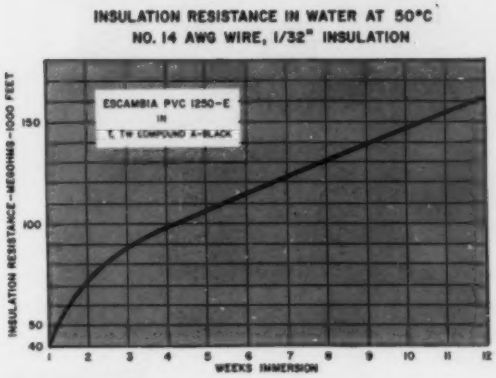


With ESCAMBIA PVC 1250-E

OUTSTANDING INSULATION RESISTANCE WITH THIS EASY PROCESSING RESIN



Electrical properties and product quality your customers want and money-saving processing advantages for you—that's what you get with ESCAMBIA PVC 1250-E.

This resin is now on the UL interchangeability list—ready to bring you products that will please your customers and profits that will please you. See for yourself what this resin can do—make a trial run in your plant now.

- Free-flowing hot dry blends
- Extremely low gel count
- Excellent color and clarity
- Uniform particle size
- Freedom from fines
- Outstanding heat stability

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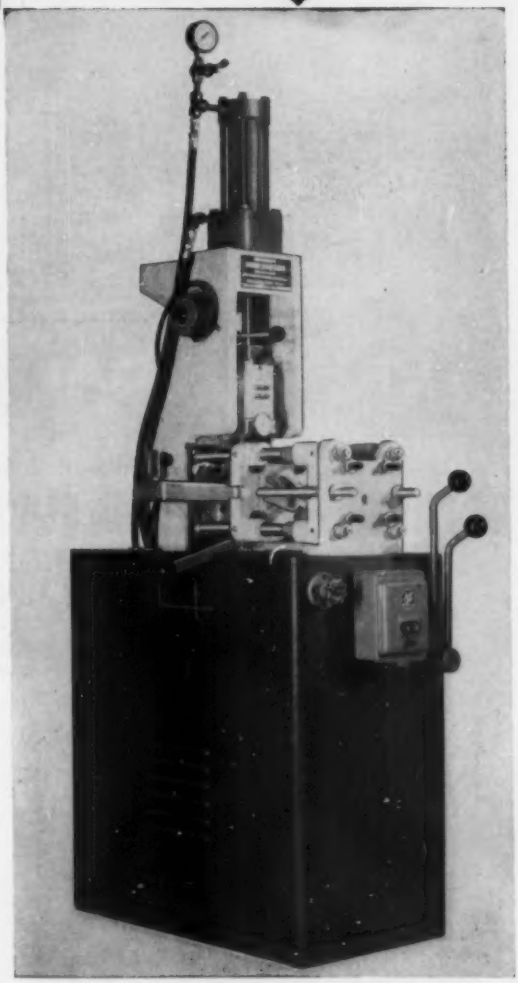
NOW MOLD THEM ALL AT LOWER COST ON THIS ONE!



THE NEW, 4-IN-ONE "UNIVERSAL" MINI-JECTOR®

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Plastic Injection Molding Machine

★ **More Features**—Combined advantages of all 4 top standard model MINI-JECTORS into one "do-all" machine.

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★ **Mold Nylon**—Adapter Assembly for finest conventional and insert molding in Nylon.

★ **Easy to Operate**—No special knowledge or skill needed for efficient operation.

New, Feature-Packed "UNIVERSAL" MINI-JECTOR . . . Your one machine for complete, variety molding up to 1 oz. Conventional and Insert.

One machine does it all! Eliminates expense of extra equipment and machines; saves high "per-piece" costs of big-press tooling where not required. Ideal for developing and producing widest varieties of small injection molded parts; from precision miniatures to full-size, single cavity items up to 1 oz. Features both conventional production and intricate insert molding in all thermoplastics, including Nylon. Most versatile, flexible machine of its type—at the lowest cost. Adapts quickly, easily to all variables in your most diversified plastic item programs. Learn how the multi-feature "Universal" can be the "work-horse" in your plant for small plastic parts. Write today.

"Universal" MINI-JECTOR—combines features of "Super Hornet", Special Mod. 50 "Wasp", Mod. 60 HC75, and "air-JET". Includes adapters and accessories for development and production of virtually all plastic injection molding of variety items to 1 oz. capacity.

See Complete MINI-JECTOR Line of Machines and Accessories. Illustrated catalog details specifications; technical data on performance, applications, etc. Shows how MINI-JECTOR modernizes methods in hundreds of plants. Mailed free at your request.

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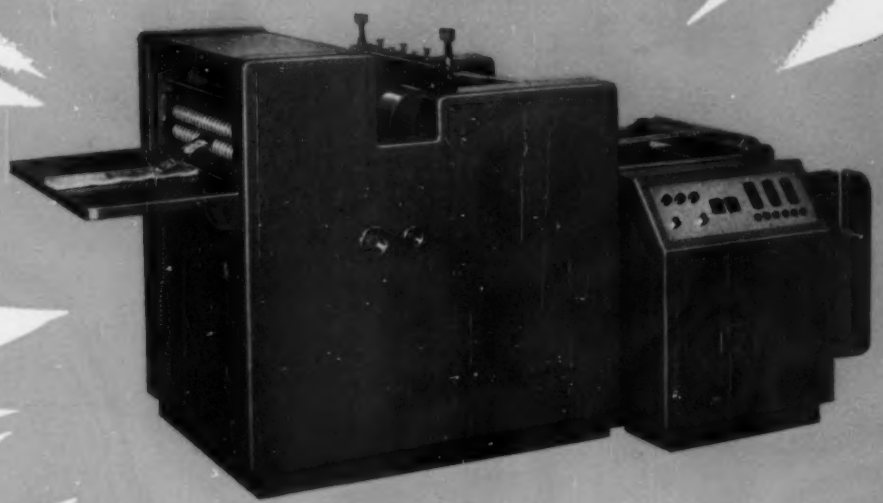
Box 394, Newbury, Ohio

AUTOMATIC BAG MAKER. This patented, photoelectric cell-controlled Welding-Cutting Machine, Type ST/500, is manufactured by S.C.A.E. It is the most perfect tool for making pre-printed, coloured and neutral bags in every shape with polyethylene, PVC and many other plastic films.

Its simple features, strong gears and real ease of operation bring you the highest and most perfect production rates attainable today.

IT MAKES 15,000/20,000 BAGS PER HOUR



Patented, Automatic, Photoelectric Cell-Controlled WELDING-CUTTING MACHINE, Type ST/500

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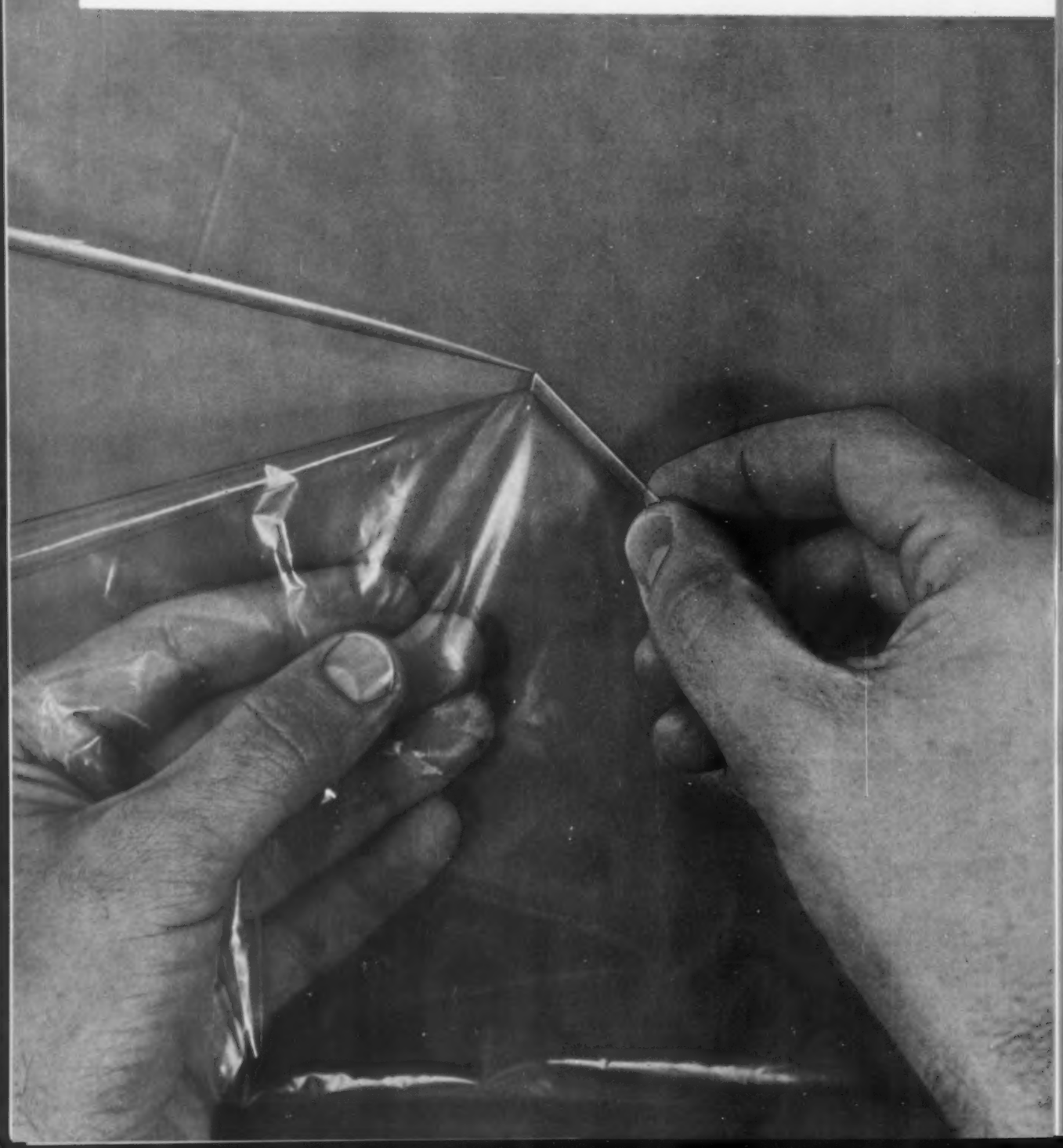
New MARLEX* transparent breaks the packaging



polyethylene film cost barrier!

Costs 16% to 39% less than cellophane

Recent Phillips developments make it possible for film manufacturers to extrude *clear, transparent film* from MARLEX resin. And this new MARLEX film can be readily torn in a straight line *with no tear tape whatsoever!*

MARLEX film *equals* cellophane in clarity, sparkle and crispness . . . *equals* ordinary polyethylene in printability. MARLEX film as an overwrap is *far superior* to cellophane in shelf-life because it is unaffected by moisture . . . does not become brittle on the shelf. MARLEX film resists fats and grease. Freeze it! Boil it! MARLEX film can take it!

The new, low-cost, heat-sealable MARLEX film has excellent stiffness and slip. It handles efficiently in "push-through" overwrap machinery equipped to seal polyethylene. Here at last is a polyethylene film with none of the limpness, sag and blocking tendency of conventional polyethylene.

Whatever your products—baked goods, candy, cigarettes, frozen foods, cereals—you can now package them *better* for *less* money in MARLEX film.

If you *make* film . . . if you *use* film, get in touch with our nearest Plastics Sales Office for full information.

No other type of material can serve you so well in so many different ways at such low cost.

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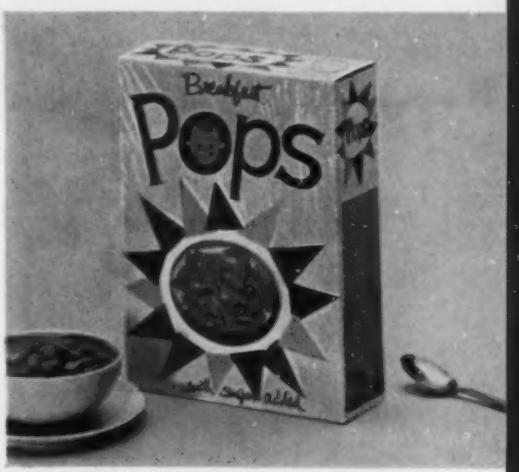
*MARLEX is a trademark for Phillips family of olefin polymers.

Bread and other baked goods stay oven-fresh longer when packaged in sparkling clear, low-permeability MARLEX film. This economical film is readily printed and heat-sealed.

Candy, nuts and other foods last longer on the shelf when sealed in MARLEX film. If creamy, they won't dry out. If crisp, they won't get soggy. Fine for window packages.



Cereals, crackers and various soft goods packaged in boxes maintain their original fresh appeal with MARLEX film overwrap. It's also available in appealing *colors!*

ARE YOU A MAGICIAN?

'Abracadabra' never got anybody anywhere, in spite of what we're led to believe when young. And if your problem is finding the right injection moulding or extrusion materials, the answer's as unlikely to come popping out of a hat as the proverbial rabbit. Far better pin your faith in Kleestron—recognised by countless large manufacturers as the leaders in the polystyrene field. The soundness of their judgment is easily tested—write or 'phone us about your need:

Kleestron Limited

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Kleestron make a comprehensive range of general polystyrenes and impact materials —and will gladly supply technical details, prices, etc.

HEAVY-DUTY thrust bearing assemblies

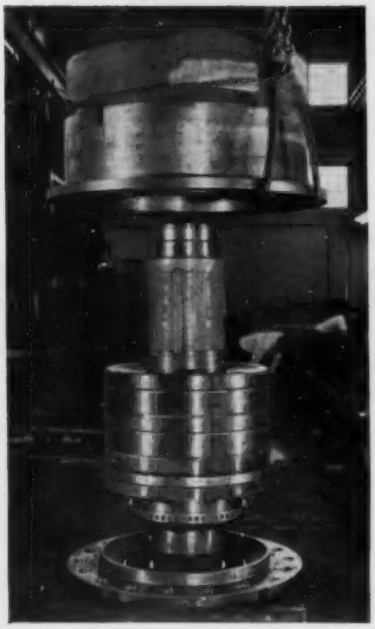
assure

- LONGER LIFE
- LESS MAINTENANCE
- LESS "DOWN TIME"

for

NRM *Thermoplastics* EXTRUDERS

NRM 3½" Electrically Heated Model 55 Extruder with Handy Clamp Die Head.



This heavy-duty thrust and radial bearing is being assembled for a 15" NRM Thermoplastics Extruder.

The thrust bearing is one of the most important parts of the plastics extruder transmission. It must be able to receive thrust loads under severe operating conditions. To do this satisfactorily, it must be mounted in a manner assuring permanently true alignment, and must be lubricated by a method assuring the bearing of a continuously circulating bath of the lubricant. Inadequacies in either of these basic requirements results in premature thrust bearing breakdown, costly repairs and loss of valuable production time.

Thrust bearings used in NRM Extruders are *specially designed* to meet these requirements. *Proving* their dependability is the fact that many in the field have given service for nearly twenty years without mechanical difficulties, and that thousands of others are still performing perfectly *far beyond* expected service life. Some of the reasons for this exceptional performance are:

ENGINEERED LOCATION — NRM thrust bearings occupy the optimum position for receiving thrust loads under the most severe extruding conditions.

HIGH LOAD CAPACITY — NRM thrust bearings are heavy-duty throughout, and properly sized for each extruder to permit continuous peak operation, and provide ample safety factor for absorbing nominal extruder overload.

EASILY MAINTAINED — Positive, automatic lubrication from the transmission eliminates accessories requiring maintenance, and reduces servicing time to a bare minimum. Production time is increased.

Write for more details on NRM Plastics Extruders. See how their mechanical dependability, plus their many operating advantages can add up to more profit on plastics extruders for you. "Go NRM" the next time you purchase plastics extruders and accessories.

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A convincing number of polyester manufacturers have profitably learned this fact:

> Increased filler loadings—up to 70% of the resin-filler mix—can increase flexural strength and lower water absorption. Your costs go down.

What fillers? DIAMOND suggests these three:

> SURFEX® MM—Particle size: 1 to 5 microns. Resin coated. Oil absorption 20-22 cc per 100 grams.

> SUSPENSO®—Particle size: 1 to 5 microns. Uncoated. Oil absorption 20-22 cc per 100 grams.

> KALITE®—Particle size: about 1 micron. Oil absorption 28-32 cc per 100 grams.

Your nearby DIAMOND sales representative can show you money-saving formulas and detailed cost comparisons. Or write DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Boston.

Distributors of These Products: C. L. Duncan Co., San Francisco and Los Angeles; Van Waters and Rogers, Inc., Seattle and Portland, U.S.A. Harrisons and Crosfield (Canada) Ltd.

Diamond Chemicals

"U.S." DRUM TUMBLERS
with FLOOR-LEVEL LOADING

EASY TO USE... FOR FAST, EFFICIENT MIXING

These "U. S." Drum Tumblers provide a quick, effective, economical method of mixing and blending many types of materials in suppliers' metal or fiber drums. They are designed for extra ease of operation with the unique floor-level loading and built-in drum extender features illustrated at right.

They are precision-built, of sturdy welded steel construction for years of trouble-free service under rigorous operating conditions. The rugged steel base provides rigid support for handling unbalanced loads of varying weight. Positive roller chain drives, extra powerful motors and heavy-duty ball bearings assure smooth running under heavy loads.

Tumbling speed is 30 RPM. Motors are 220/440 volts, 60 cycles, three phase. If other motor characteristics are required, specify on order.

These units are built in a range of sizes to handle standard fiber or metal drums. Each handles two drums of equal capacity. However, on special order we can furnish units equipped to tumble a different size of drum on each side. Our Engineering Department will be glad to offer specific recommendations on any special mixing requirements you may have.

EXCLUSIVE FEATURES!

Floor-level Loading

Drum holders swing to vertical, floor-level position for quicker, easier loading and unloading. Drum is closed when tipped to operating position. Thus, there is no danger of spillage in handling full drums.

Built-in Drum Extender

Provides extra space for thorough mixing of full drum loads. Equipped with fast-acting toggle clamps for rapid opening or closing in one easy motion. Locks quickly and securely.

TYPICAL SPECIFICATIONS*

Drum Dimensions		Capacity per Drum (Lbs.)	Overall Dimensions (Less Drums)			Motor HP	Approx. Shipping Wt. (Lbs.)
Diameter	Height		Length	Width	Height		
23"	36"	250	85"	48"	50"	1	945
23½"	38"	375	86"	50"	52"	2	1025
24"	45"	500	90"	58"	58"	3	1110

*All units are custom-built on order to handle established drum sizes and to meet specific mixing requirements.

188F

PROCESS EQUIPMENT DIVISION

U. S. STONEWARE

AKRON 9, OHIO

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. . . Time to wake up and let PEERLESS show you what's new in Plastics Marking.

We at PEERLESS have developed a roll leaf that resists wear . . . oil and alcohol stain . . . perspiration . . . and most every type of punishment possible.

PEERLESS Roll Leaf Company has marked practically every type of plastic . . . has made equipment for marking most every size and shape of plastic product . . . and continues to be first in their field with new advancements in plastics marking, and the manufacture of plastics marking machinery.

Come on now, sleeping is all right at home, but not during a working day . . . wake up . . . call or write PEERLESS . . . let us tell you "what's new".

Achievement toward Perfection

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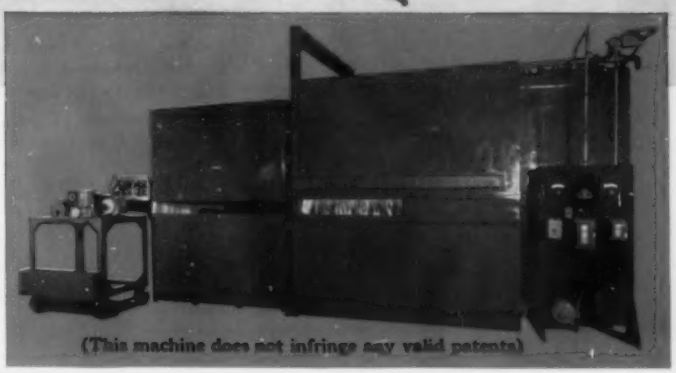
LOW COST MOLDING MAGIC

Mold small or large vinyl products economically!



(This machine does not infringe any valid patents)

Now a low capital investment provides you with this single spindle production machine capable of rotationally molding small or large products. This type machine is made with a 25" diameter molding area and a 75" diameter molding area, which gives you a selection of 5 different machines designed for small, medium or large quantity production.

This is a complete unit for manufacturing products from polyvinyl chloride plastisols, vinyl foam, or polystyrene expandable beads. The manufacturing process is simplified because the materials are scientifically prepared by the nation's foremost companies specifically for your product.
Whether you want small, medium or large quantity production equipment, the Akron Presform Mold Co. can supply your needs with rotational molding machines, dispensing units and molds to produce any item you select. We'll be glad to show you actual facts and figures and your own product being made. Let us demonstrate our Molding Magic right before your eyes.

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THE AKRON PRESFORM MOLD CO.

Phone WA 8-2105

2044 Main Street, Cuyahoga Falls, Ohio

FORMS	MOLDS	DIES	MACHINERY
LATEX DIPPING	STEEL AND ALUMINUM	PLASTIC INJECTION	SPECIAL AUTOMATIC

. . . . extrude it on a Reifenhäuser!

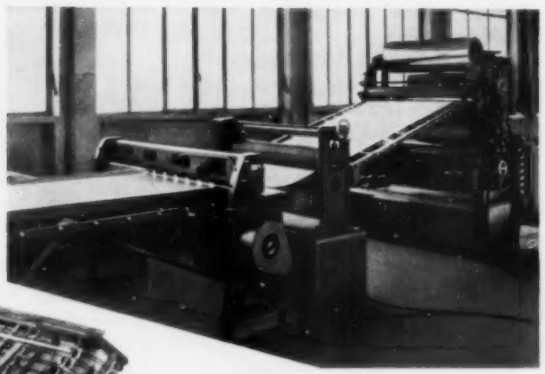
(with screw diameters 1¼", 1¾", 2½", 3½", and 6" approx.)

Special slit-die head and polishing machine

In addition to our line of extruders (1¼", 1¾", 2½", 3½" and 6" screw dia.) Reifenhäuser furnishes complete and automatic "package units", for every type of Thermoplastic Extrusion.

Yes, Reifenhäuser Extrusion Equipment enjoys a world-wide reputation for its superior engineering features, its dependability to extrude difficult materials, and its efficiency in operation.

Keep in step with progress by writing us today for full information on the new Reifenhäuser Extruder.



The plant for plastic-sheets – General view –

Automatic sheet stacking table

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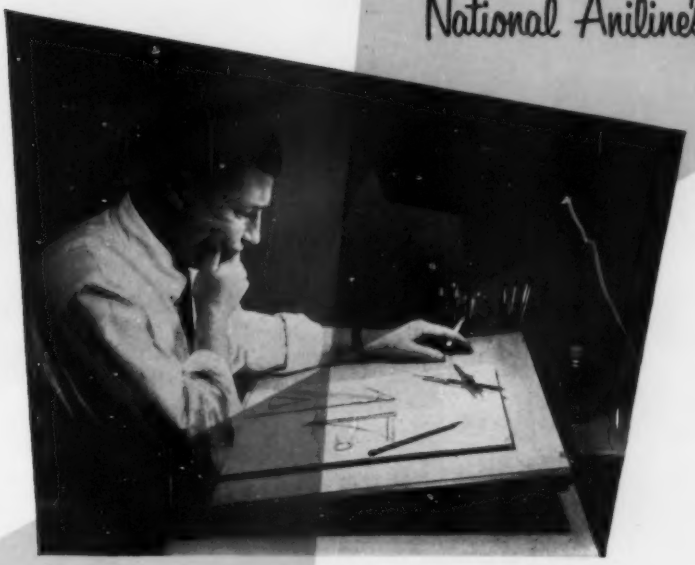
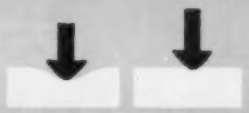
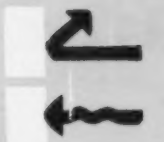
National Aniline's Nacconates®





Foams—Flexible to rigid Open or closed cells. Densities from one to 30 lbs/cu. ft. or more!



Cushioning—For comfort *or* shock absorption and vibration isolation! Resilience controllable from "dead" to full of "life"!

Durability — Excellent mechanical properties and resistance to aging, chemicals, cleaning and mildew!

Insulation—Thermal . . . acoustical . . . or electrical. Outstanding for all three!

Elastomers—They're resilient as rubber and wear like steel!

Never before a material like it!

You prescribe the properties you need. Urethanes are more likely to give you exactly what you want . . . better, faster, easier and more economically . . . than the material you are now using. Some of the amazing possibilities are shown here!

YOU SAVE PRODUCTION COSTS, TOO!

Urethanes start closer to your finished product, eliminate many production steps. They can be molded to required shapes, foamed in place to fill voids. They adhere to other materials or encapsulate difficult shapes. They can be used in strong but lightweight sandwich construction, sprayed to adhere even to vertical or overhead surfaces. Slab stock can be sliced, die-cut, sewn, tacked or hog-ringed.

INFORMATION FOR PROSPECTIVE USERS

As makers of NACCONATE® Diisocyanates, basic urethane chemicals, we have gathered considerable application data. We will be glad to furnish pertinent information if you will write on your company letterhead briefly describing your particular interest.

Allied Chemical

NATIONAL ANILINE DIVISION ALLIED CHEMICAL CORPORATION • 40 RECTOR STREET, NEW YORK 6, N. Y.

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Acetate Sheeting...

the perfect plastic material for blister packaging. JODA extruded acetate sheets, rolls and film in light to heavy gauges—transparent, translucent or opaque—is excellent for vacuum forming. Plastic Enterprises, College Point, N. Y., has used this versatile material to good effect in the smart point-of-purchase display shown here, incorporating vacuum-formed blister packaging for sun glasses. Another example of clever packaging used to increase sales, it is further proof that products SEEN better SELL better!

BUTYRATE and LINEAR POLYETHYLENE available in standard sizes.

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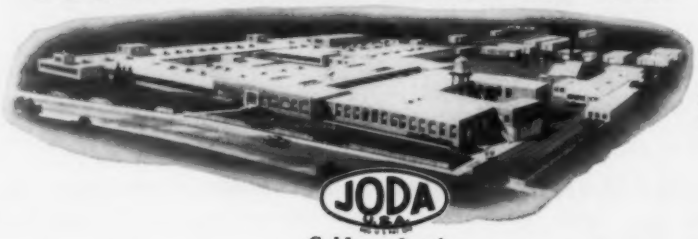
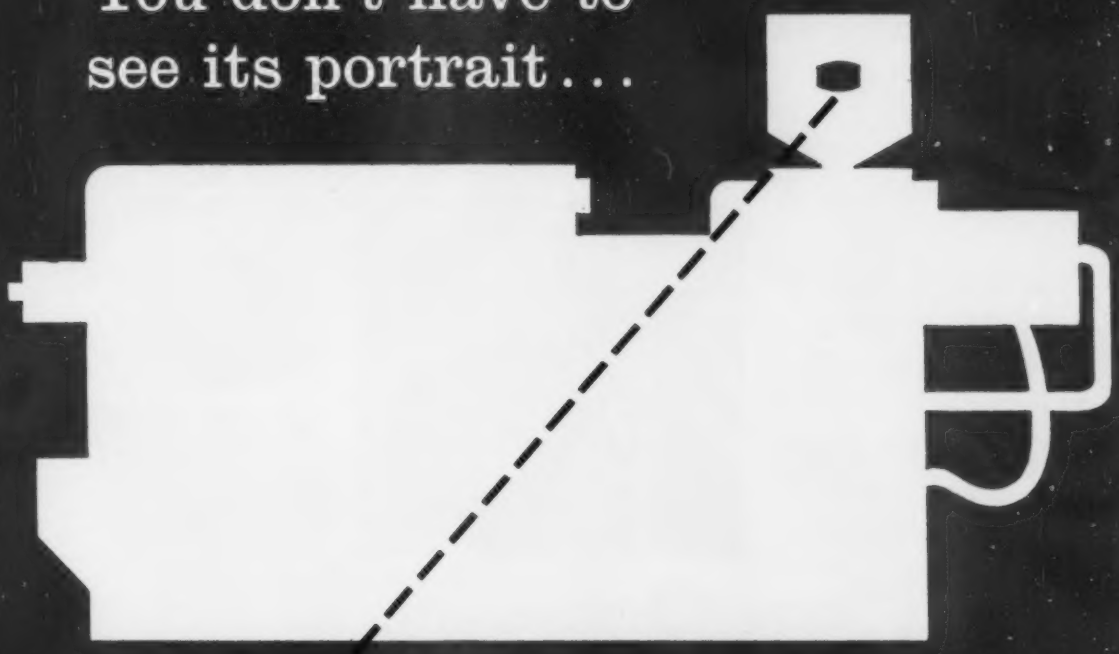


Sales Representatives
Conveniently Located

Cable — Insel

You don't have to see its portrait...



PECO PRODUCTS

If the name is PECO you can take the rest for granted

- Longer (and adjustable) mould-closing strokes
- Larger platen areas
- Fast cycling equipment
- High plasticising capacities
- Technical service on all moulding problems
- Progressive and continuous development and research
- Active and co-operative "After Sales" service

These and other advantages are offered in the wide and comprehensive range of Peco machines of ½-60 oz. capacity

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PECO MACHINERY SALES (Westminster) LTD
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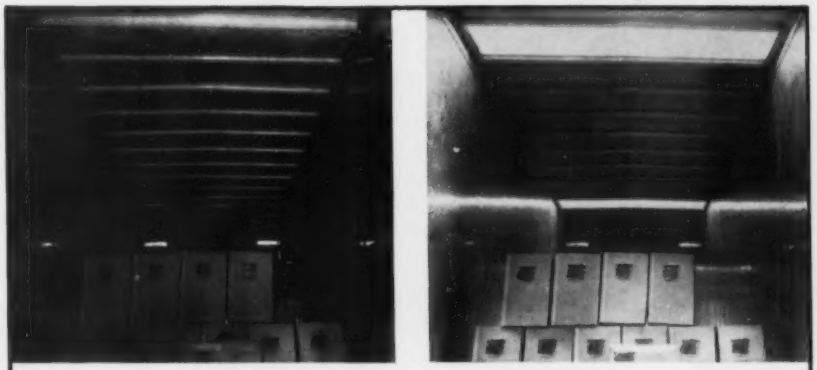
Garan® ROVING & RESIN
COMBINE TO PRODUCE

Practical New Truck Skylight

Panel Made From Garan Woven Roving Increases Truck Utility by Permitting up to 60% Light Transmission With No Sacrifice of Mechanical Strength in Roof



HERE'S POSITIVE PROOF*

Photograph at left was taken with skylights covered. Front roof caps were left uncovered and one rear door open 12". Light meter reading of 0.2 candle power.

Photograph at right was taken of same trailer with one rear door sealed and second open one foot. No artificial light used. Light meter reading was 3.2 candle power.

*Unretouched photographs taken by Fruehauf Trailer Company, Detroit, Michigan.

Garan Woven Roving produces laminates having uniformly high physical properties.

Fiber Glass Industries, Inc., Amsterdam, N. Y. produces Polyply Skylights in widths of 19 and 25 inches, in lengths of 90 to 94 inches with three layers of resin bonded ROVCLOTH molded to the panel's metal frame.

Another efficiency problem in multi-stop trucking operations has been solved – thanks to the unique characteristics of Garan Roving, pioneered by L·O·F Glass Fibers Company.

Diffused light into truck trailer working areas now permits sorting, checking and delivery organization without moving items to the door for label reading.

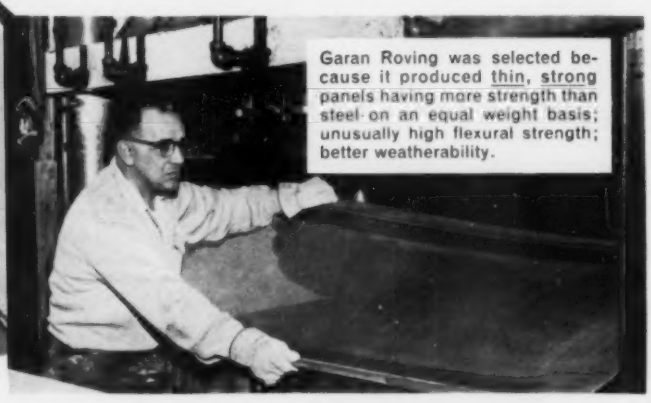
WITH GARAN WOVEN ROVING YOU GET:

faster wet-out . . . better bond . . speedy production.

improved flexural, compressive and tensile strengths.

high wet-strength retention . . . added durability.

Because Garan Roving is made by the marble process, it permits clearer, color-free laminates . . . a feature of great importance in applications where translucency is required.



Garan Roving was selected because it produced thin, strong panels having more strength than steel on an equal weight basis; unusually high flexural strength; better weatherability.

For technical information about Garan Roving and how it can help improve your product . . . open new markets, call our nearest sales office, or write: L·O·F Glass Fibers Company, Dept. 15-68, 1810 Madison Avenue, Toledo 1, Ohio

L·O·F GLASS FIBERS COMPANY
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Admex Product · of · the · Month

Profiles **THAT SOLVE PROBLEMS . . . CUSTOM EXTRUDED IN VINYL BY VERSATILE GEAUGA INDUSTRIES**

From rough drawings to mass production, Geauga Industries are superbly prepared to meet custom vinyl extrusion problems with production line economy. Geauga's skilled plastics engineers readily tackle problems ranging from original designs and die development to compound formulation and even assembly economies in the customer's plant.

ADM's Admex vinyl plasticizers find their way into Geauga formulations when complete control of heat and light resistance, cold temperature flexibility, and elimination of migration and enamel lifting are necessary. Admex vinyl plasticizers can successfully and profitably solve your formulating problems, too. Why not write us today for technical data and samples?

Admex
Vinyl Plasticizers

ADM PRODUCTS: Linseed, Soybean and Marine Oils, Synthetic and Natural Resins, Fatty Acids and Alcohols, Vinyl Plasticizers, Hydrogenated Glycerides, Sperm Oil, Foundry Binders, Bentonite, Industrial Cereal, Vegetable Proteins, Wheat Flour, Dehydrated Alfalfa, Livestock and Poultry Feeds.

Archer-Daniels-Midland

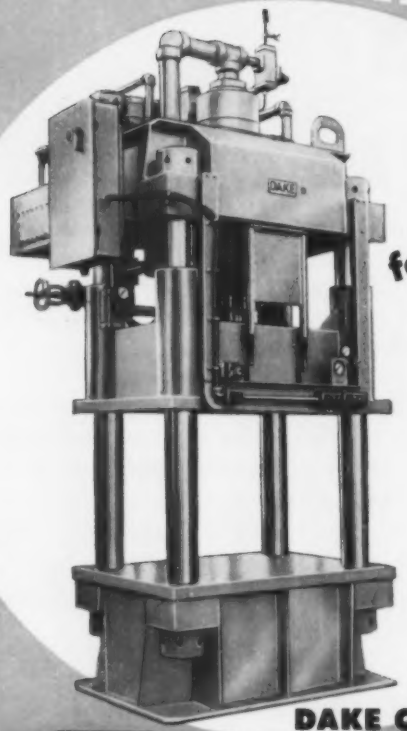
Archer QUALITY

717 INVESTORS BUILDING, MINNEAPOLIS 2, MINNESOTA

available in standard and custom engineered models

for trimming and piercing vacuum-formed plastics

DAKE HYDRAULIC PRESSES



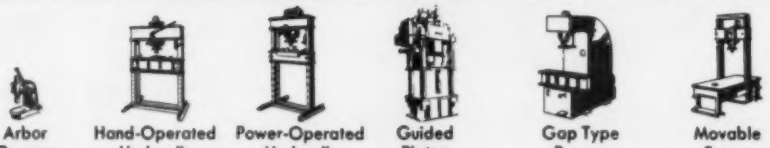
for molding reinforced plastics

Be a pacemaker in the fast-moving plastics industry with equipment designed to keep production geared to modern trends. Dake Hydraulic Presses speed output and reduce costs. They are job-engineered by men experienced in the plastics industry. These men are ready to help you meet special requirements as well as provide better equipment . . . both for compression molding of reinforced plastics as well as trimming and piercing vacuum-formed plastics. Standard models are electric-hydraulic in operation, with capacities ranging from 25 to 300 tons. They are adjustable for stroke, pressure, temperature and timing. Dual palm-operated controls are standard, providing safety in operation. Dake will gladly work with you in developing whatever special press equipment you need.

For descriptive literature on these presses, write for Bulletins 340 and 352.

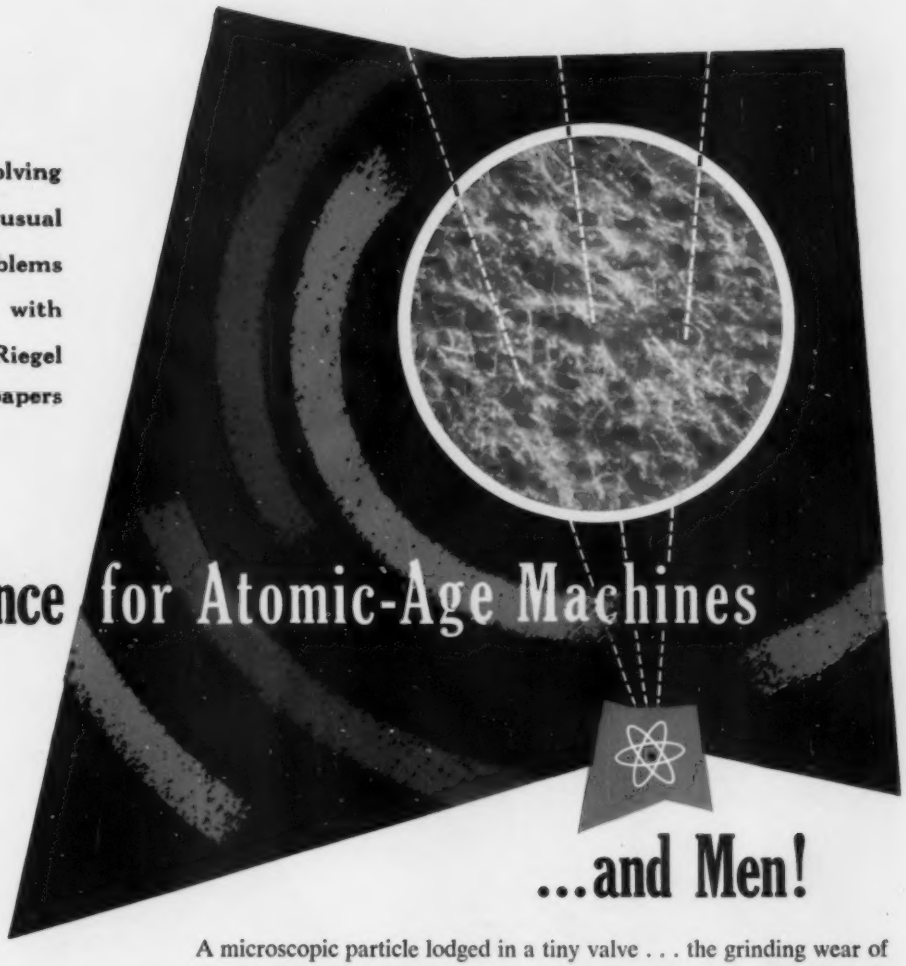
DAKE CORPORATION 648 Robbins Road, Grand Haven, Michigan

DAKE PRESSES



Arbor Presses | Hand-Operated Hydraulic | Power-Operated Hydraulic | Guided Platen | Gap Type Presses | Movable Frame

Solving unusual problems with Riegel papers



Life Insurance for Atomic-Age Machines ...and Men!

A microscopic particle lodged in a tiny valve . . . the grinding wear of dirt in a high-speed engine . . . radioactive particles escaping into air . . . all these spell death to atomic-age machines . . . and to men.

Needed: new high-performance filters . . . at prices that permit universal use and low-cost disposability.

The engineers turned to paper . . . and to Riegel. And believe us, some of the problems brought to our researchers were tough. Our wide experience with unusual fibers (even glass and nylon), and with impregnations and coatings saved many a day. Special problems of strength, resistance to water or solvents, and precise control over porosity often required the creation of ingenious new quality control techniques.

Results: a host of successful Riegel papers for things like "absolute filters" in atomic installations, automobile oil and air intake filters, gas masks, and vacuum cleaner bags.

Riegel specializes in developing, manufacturing and converting *technical papers that solve problems.* More than 600 kinds . . . many with properties that will intrigue you . . . have already been made on our 14 paper machines. If you have *any* idea for doing something in a better way . . . with a better paper . . .

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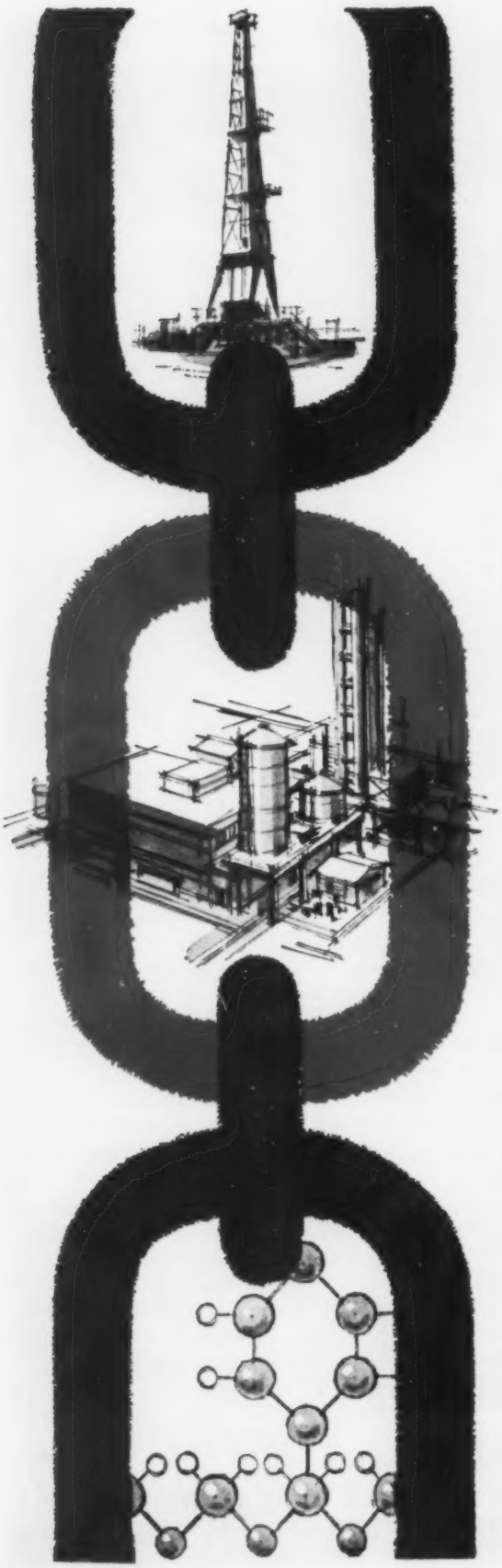
TECHNICAL PAPERS FOR INDUSTRY



Blaw-Knox supplies vital link in Cosden's crude-to-plastic chain

From crude oil to ethylbenzene to styrene and finally polystyrene—with this pace setting program, Cosden Petroleum Corporation makes oil industry history. In designing and building Cosden's polystyrene plant, Blaw-Knox proudly joins this enterprising company in the vanguard of petrochemical activity.

A unique combination of know-how in resin manufacturing, chemical production and petroleum refining has made Blaw-Knox a leading contractor for industry's most progressive projects.

Perhaps this background of over 90 plastic and resins facilities can be helpful to you. Contact our engineering staff for a conference. Blaw-Knox Company, Chemical Plants Division with headquarters in Pittsburgh. Branch offices in New York, Chicago, Haddon Heights, New Jersey, Birmingham, Washington, D.C. and San Francisco.

for plants of distinction . . .

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give your plastic products the benefit of the

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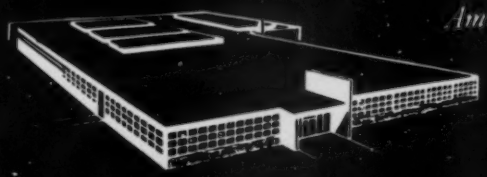
Precision Molding

The Makray "OK" on your product is the result of a unique system of engineering, designing, molding and assembly room techniques that result in the best in plastics technology. But, while we are unique in the quality of painstaking craftsmanship and inspection that we apply to your products, we are completely competitive in price. Whether we originate the design or work from yours our objective is the same: To give you a plastic product that looks better, works better and sells better.

When you are in or near Chicago come out and visit us. You'll see why results are finer from America's finest injection molding plant. Or, call or write today for the complete story on the Makray "OK"

Durable plastic housing gives clean, efficient look to household product.



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Precision Plastic Molders

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design with assurance!

Cycolac can work design wonders for you. Extensively used in a host of end-use products similar to those illustrated here, Cycolac can help you design finer, more attractive-looking products—premium quality merchandise that stresses sturdiness, easier assembly, faster production and lower costs. Yes, to design it with full assurance, specify Cycolac.

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HIGH-IMPACT THERMOPLASTIC RESIN

...molded parts, extruded profiles, calendered sheets.

This family of single uniform resins provides a unique balance of properties, permitting fast molding, calendering and extruding. It is economical to form Cycolac press-polished sheets by vacuum, air-pressure, or mechanical methods over inexpensive molds of wood, plaster, aluminum, etc.

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PROCESS ALL YOUR SCRAP

Right in your own plant! With De Mattia Scrap Grinders in your molding shop you can reclaim all your scrap — large chunks from heating cylinders, accumulations from nozzles and real tough molded pieces — in your own plant, at once. Models for press-side installation save handling and make salvaged material immediately available. There is a De Mattia model for every scrap processing need.

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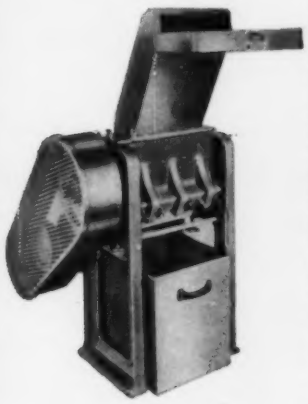	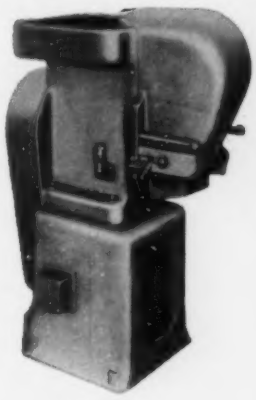	
Simple, rugged and highly efficient. Has capacity of 200 lbs. per hour. 3 H.P. Motor with double V belt and Meehanite flywheel. Features high grade roller bearings with positive seal. Four cutting blades placed on a bias permit efficient cutting of thin strips in Vinyl, Saran, etc. Standard screen with ¼" openings (other screen sizes on request). Hopper opening 13¼" x 4½". Floor space required 32" x 44"; net weight with motor (approx.) 800 lbs.	For low-cost salvage of the large slugs and chunks resulting from cleaning out the heating cylinder, accumulation at the nozzle and also those molded pieces too tough for the average sprue and scrap grinder. Capacity — Over 150 lbs. per hr. 3 H.P. Motor in Base. Double V Belt Drive. Heat treated Alloy Steel Rotor High Grade Roller Bearings with Positive Seals. Standard Screens with 11/32" Openings (other sizes on order). Hopper opening 9" x 4¼".	Recommended for at-the-machine operation. Capacity 75 lbs. per hour; 2 H.P. Motor 1200 RPM; Direct drive; Solid semi-steel hopper; High grade roller bearings with positive seals; Standard screen with 11/32" opening (other sizes on order). Hopper opening 9" x 4¼". Overall dimensions 39" long, 18" wide, 42" high. Net weight 500 lbs. with base.

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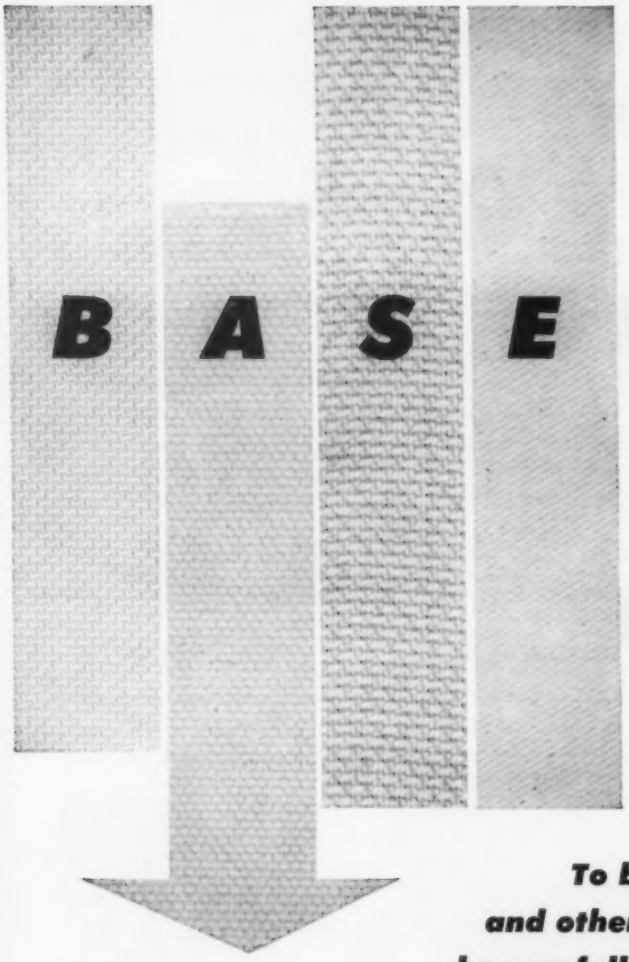

a BASE fabric's work is only as good as its bond!

To bond well with plastic, rubber and other materials, base fabrics must be carefully selected for the specific job

The success of end products made through the coating, laminating, combining or frictioning of a fabric often depends on how well that base fabric bonds or unites with the vinyl, neoprene, natural rubber, phenolic resins, etc.

At Wellington Sears, many factors are considered in choosing a base fabric. These are related to the job to be done, and the materials to be united with the fabric. Some are: fiber affinity for these materials; form in which fiber and yarn are used; effect of yarn twist, thread count, fabric sizing, and special fabric treatments. Further, the base fabric must meet requirements as to flexibility, strength, weight and other characteristics before it gets a final okay. With such care (and a century of experience) working for you, you're in good hands whenever you take your working-fabric problems to Wellington Sears! For informative booklet, "Fabrics Plus," write Dept. K-6.

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FIRST In Fabrics For Industry

For Coated Materials, High and Low Pressure Laminates, and Other Reinforced Plastic Products

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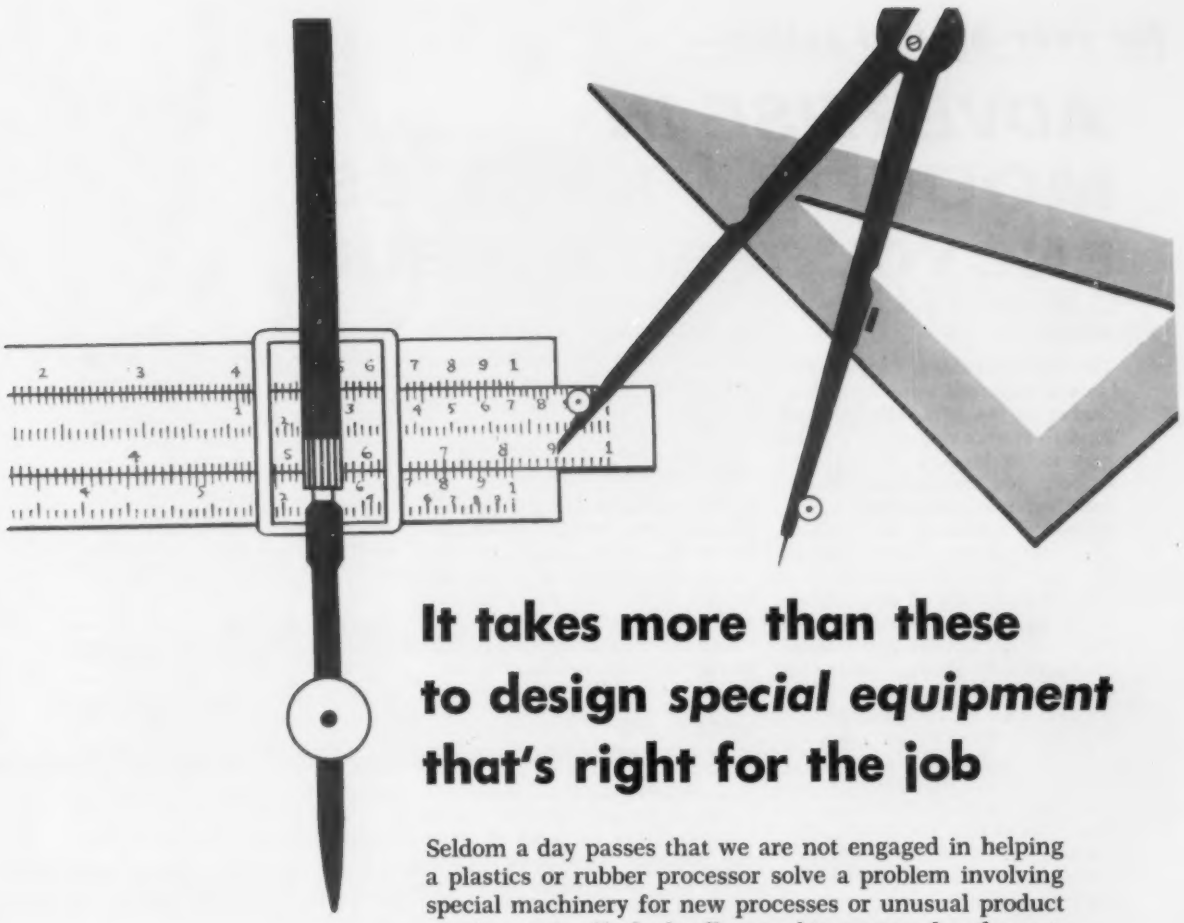

It takes more than these to design *special equipment* that's right for the job

Seldom a day passes that we are not engaged in helping a plastics or rubber processor solve a problem involving special machinery for new processes or unusual product requirements. Undoubtedly one big reason for the outstanding success of this phase of our business is that important extra "tool" Adamson United brings to the job . . . the wealth of specialized knowledge gained through more than 65 years of intimate contact with these industries.

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ADVERTISE IN MODERN PLASTICS ENCYCLOPEDIA ISSUE

WHAT IT IS

The Modern Plastics Encyclopedia issue is published annually in September as the thirteenth isssue of Modern Plastics magazine . . . and goes to all Modern Plastics subscribers. It's the accepted "workbook" of the plastics field . bound in handsome hard covers . . . carries the advertising of all the field's leading suppliers answers practically all questions relating to plastics: materials and their properties, their applications, production methods, processing equipment and machinery . contains the only complete Buyers' Directory in the field . . . is completely revised each year to cover all new developments and changes.

Because of its "workbook" nature it's used by plastics men *year-round* to find quick, accurate solutions to production and procurement problems.

WHO READS IT?

The new edition will have the same circulation as Modern Plastics magazine. Currently the figure stands at 29,000—an all time high.

This all-paid circulation covers the two basic areas of the market:

1. The "end-users" of plastics. Fully half of the Encyclopedia's total audience are manufacturers in other industries (*not* the plastics industry) who use plastics and plastics parts in large volume. Many of them operate their own plastics-working facilities; others "farm out" their plastics converting operations to contract services; and many of them employ both methods.

2. The plastics industry itself. The Encyclopedia literally "blankets" the industry; the contract converters of plastics materials (molders, extruders, fabricators, etc.); the mold and die makers; the makers of resins and molding compounds; the makers of film, sheeting and laminates.

WHAT DO THESE READERS BUY?

A glance through this issue of the magazine will give you a fairly good cross-section of the kinds of materials, supplies, services and equipment that users of plastics buy. Basic purchases include all of the following:

Chemicals and Materials

adhesives • organosols • coatings • solvents • extenders • colorants • plastisols • plasticizers • stabilizers • laminates • dyes • saturating papers • glass fibre • wetting agents • synthetic resins • mold steels • fillers • lubricants

Equipment

hydraulic systems • scales • granulators • drills • buffers & polishers • extruders • mixers • drill presses • pyrometers • accumulators • cutting tools • heat sealers • lathes • mills • grinders • embossers • molding presses • timers • calenders • duplicators • slitters • control instruments • hobbing presses • motors • ovens • heating elements.

Services

deep drawing • assembling • postforming • hobbing • fabricating • plating • embossing • molding • decorating • laminating • mold making.

WHAT KIND OF ADS WORKS BEST?

Readers of Modern Plastics Encyclopedia issue want detailed, usable facts, not broad claims or fancy artwork. When they turn to the Encyclopedia Issue, they're getting down to "brass tacks"—comparing, evaluating, making buying selections.

Here are characteristic reader comments as reported by a leading research firm:

". . . need more technical data"
". . . give an idea of price range"
". . . more data on actual applications"
". . . give more complete physical and chemical properties."
". . . be specific in performance of machinery"
". . . too many ads have incomplete data"
". . . advertising is too general"

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Two-thirds page	505
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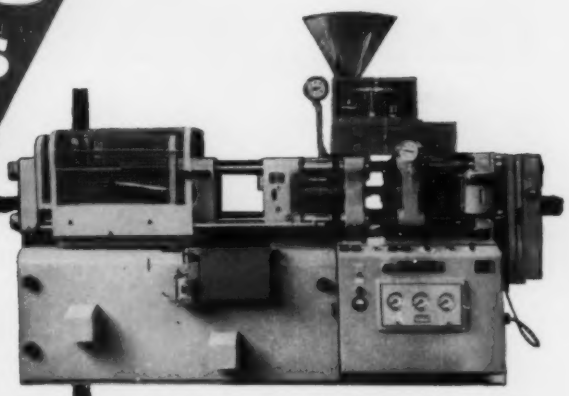
...these machines give

MOST ECONOMICAL PRODUCTION

BATTENFELD
constructs machines
for every kind of
plastics processing



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Extruders and Complete Automatic Plants

Fully Automatic Serial Extruders for closing device

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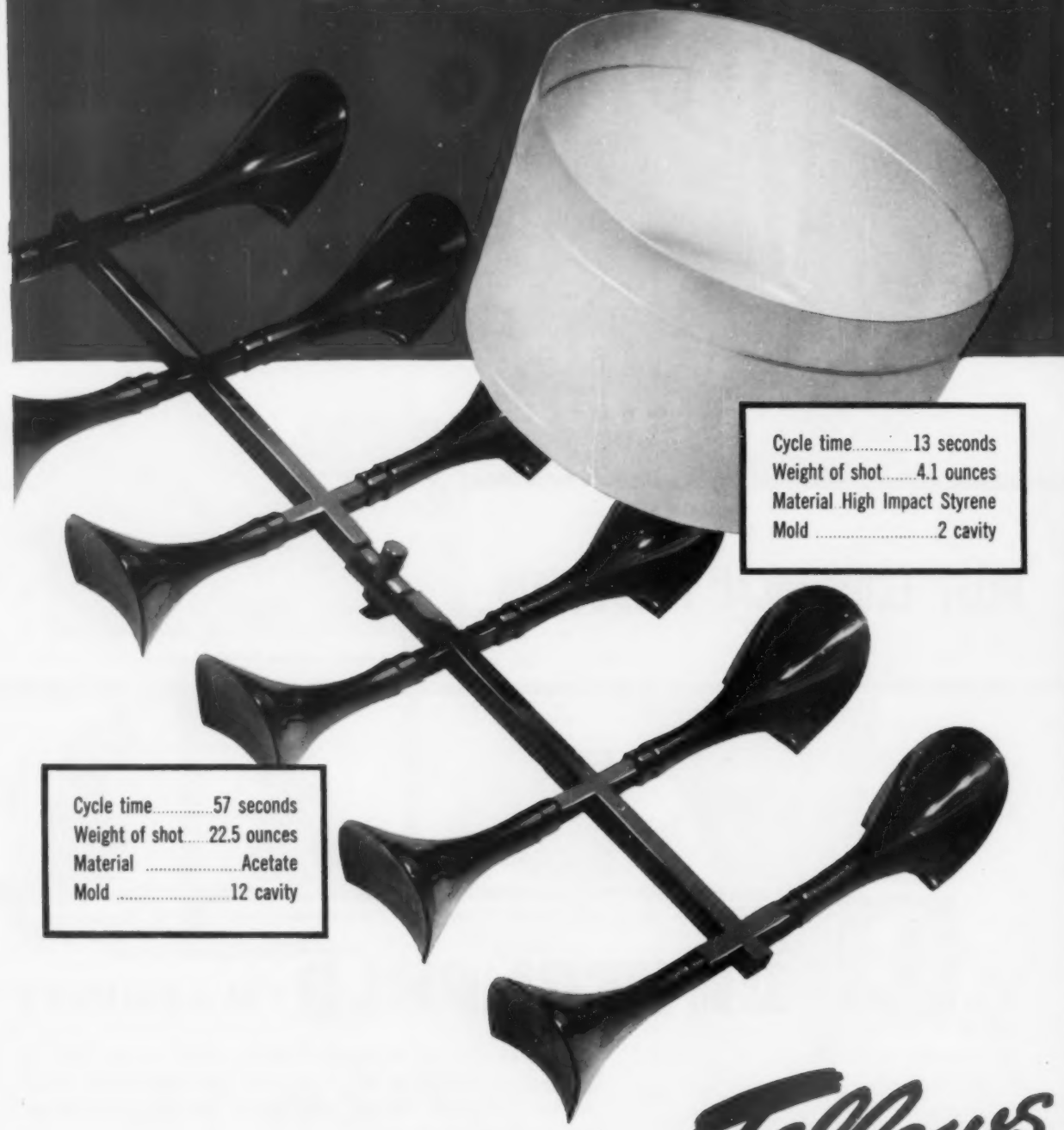
THICK or THIN.



Cycle time.....13 seconds
Weight of shot.....4.1 ounces
Material High Impact Styrene
Mold .....2 cavity

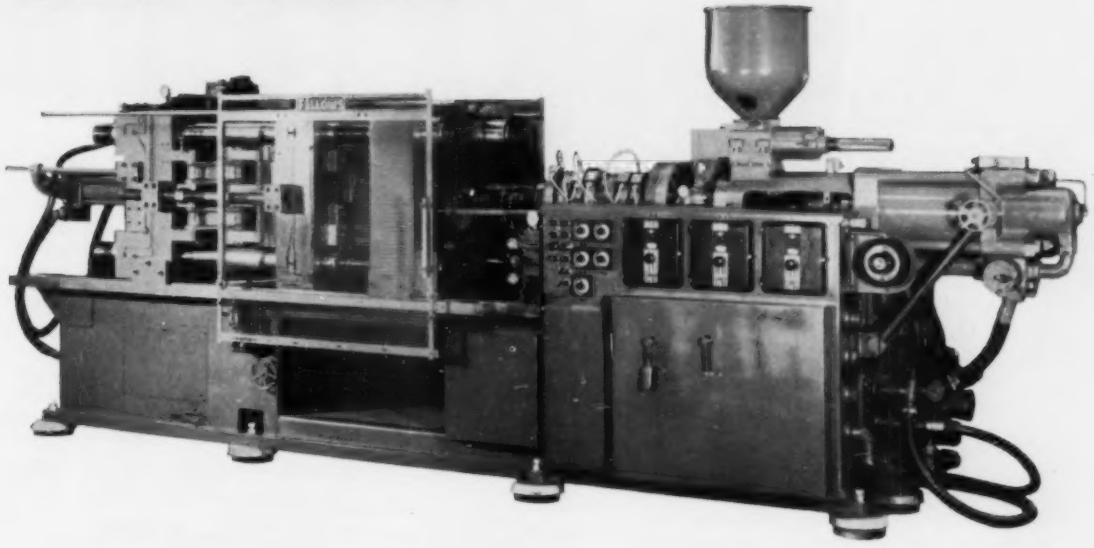
Cycle time.....57 seconds
Weight of shot.....22.5 ounces
Material .....Acetate
Mold .....12 cavity

Fellows

THE FELLOWS GEAR SHAPER COMPANY
Plastics Machine Division

Head Office and Export Department: Springfield, Vermont • Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.

Cut molding costs with FELLOWS "12-350"



Whatever you mold in its size range, thin wall sections or heavy parts, you can mold faster and more economically on Fellows "12-350"! You get larger shots, faster cyling, and true full-automatic operation even on the most difficult parts. On those large area, thin wall parts it even cycles faster than many smaller machines!

Precision controls minimize rejects, speed set-ups and change-overs on every job. Full-automatic operation means one man can operate three or more machines with ease. Controls are easy to set and check. A single control shaft sets mold height and clamping adjustment. The "12-350" dry cycles at 700 cycles per hour, makes shots over *20 ounces* with the optional Pre-Pac device.

See for yourself what a difference a new Fellows 12-350 can make in your costs. Ask your Fellows representative for full information about the fastest, most versatile automatic in the intermediate size range. And ask him about the Fellows Plans for deferred payment. Just contact any Fellows office.

injection molding equipment

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Bakelite Opens New Plastics Plant

R. K. Turner, president of Bakelite Company, with model of new polyethylene plant opened at Institute, W. Va.

A new, fully automated plant for making Bakelite high-density polyethylene is now in commercial production at Institute, West Virginia it was announced today by the Bakelite Company, Division of Union Carbide Corporation.

R. K. Turner, president of Bakelite Company said "These latest high-density polyethylene materials possess a combination of properties that will create many new markets for plastics.

"Certain housewares made from these materials will benefit from the properties of rigidity, impact resistance, high gloss and colorability imparted by high-density polyethylene. In the wire and cable field, the new materials will make possible superior abrasion resistance and thin-wall electrical insulation.

"In line with Union Carbide's practice of testing materials thoroughly before market introduction, the range of high-density polyethylene materials now available has been thoroughly tested for over a year. Property data and detailed information on fabrication techniques are available to processors," Mr. Turner said.

Another high-density polyethylene plant, located in Seadrift, Texas, will be placed in commercial production shortly. These facilities will enable Bakelite Company to supply the broadest range of both high-density and low-density polyethylene resins and compounds.

BAKELITE
BRAND

The terms BAKELITE and UNION CARBIDE are registered trade-marks of UCC.

Superior purity and resin uniformity are ensured by special control equipment, in BAKELITE's new high-density polyethylene plants.

BAKELITE high-density polyethylene automatically packaged in full-scale production. A smaller pellet size improves flow of resins.

this news—

Great new opportunities for you with new HIGH-DENSITY POLYETHYLENES!

New properties that open new markets! That's why these new BAKELITE Brand resins are big news for all processors. And don't overlook the fact that these properties have been fully tested and perfected. These new high-density polyethylenes are offered to you only after a typically thorough BAKELITE development program—a 14-month program that involved testing more than 1,000,000 pounds of these materials!

Would *higher gloss* help your product? Greater *rigidity?* Higher *heat resistance?* More *impact resistance?* These and other *tested* properties too numerous to list here are fully described in technical releases. Detailed fabrication techniques are also available. Two new plants have entered full scale production. Check your Bakelite Company technical representative *now* to discover the possibilities which these new, high-density polyethylenes offer for your operation, or write Dept. MP-206 today.

Wide Range of Properties for a Broad Field of Uses

Injection Molding— Two compounds with strength and toughness at high and low temperatures for molding bottles, containers, housewares, automotive and industrial items.

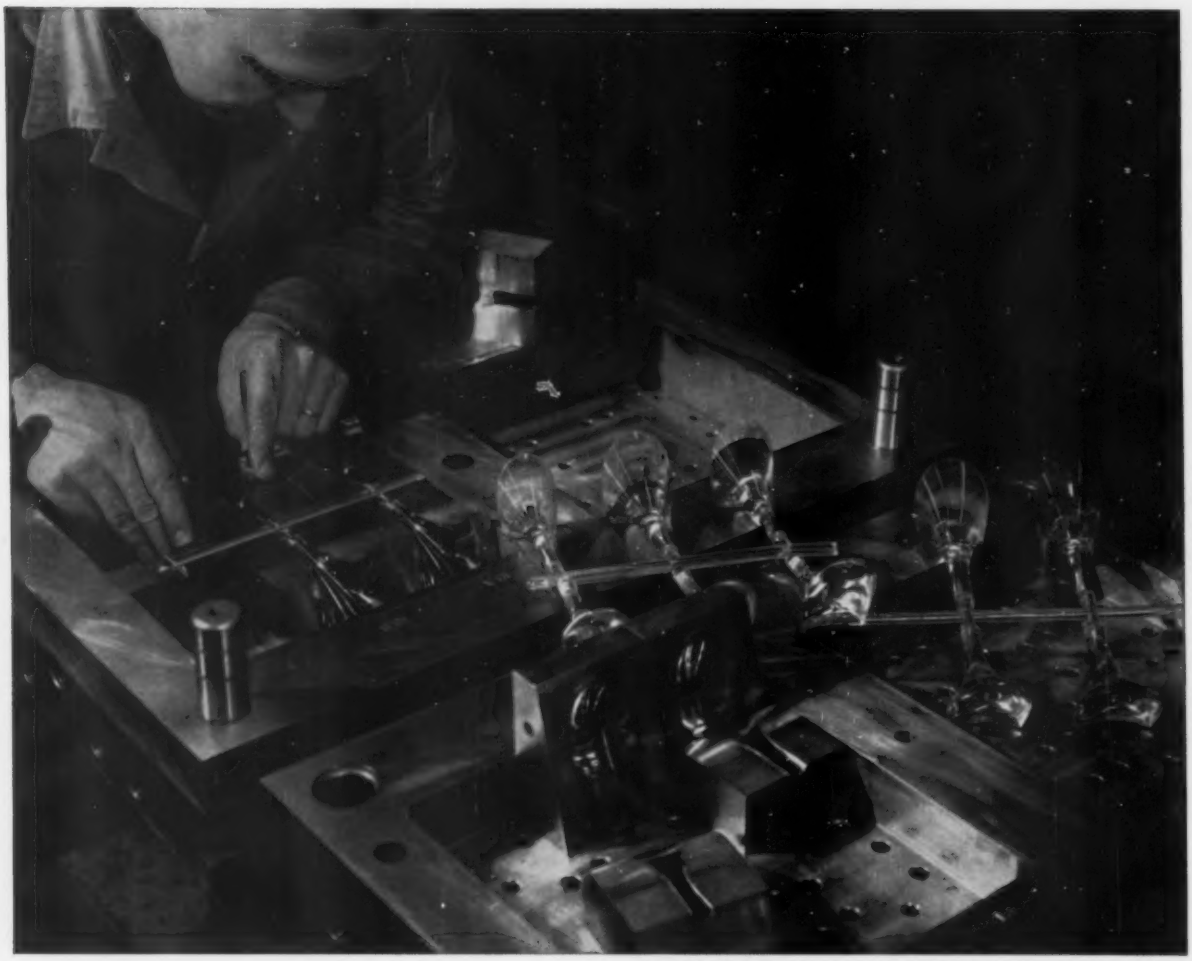
Blow Molding— New compound DMDA-4901 has 4 to 5 times the stiffness of low-density polyethylene, offers reduced permeability, higher heat-distortion resistance.

Contour Extrusion & Vacuum Forming— High-density compounds with high strength and rigidity, excellent low- and high-temperature properties, ease of extrusion, outstanding batch-to-batch uniformity.

Monofilaments— High-density compounds with improved mechanical properties and heat distortion characteristics that make them especially outstanding for monofilament applications.

PLASTICS *Products of* UNION CARBIDE *Corporation*

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.
In Canada: BAKELITE COMPANY, *Division of Union Carbide Canada Ltd.,* Toronto 7, Ont.



Lustre-Die injection mold made by Charles Zapf & Company, Evanston, Ill. Mold produces plastic heels for women's shoes at Missouri Wood Heel Co., St. Louis, Mo.

INJECTION MOLD OF LUSTRE-DIE

Makes Plastic Heels That Are Just So!

The problem wasn't easy. It called for tool steel that would (1) machine economically (2) have high mechanical properties (3) take an unusually high polish, and (4) have the stamina for volume production of slick, eye-stopper heels of butyrate and lucite, for women's shoes.

The answer was Bethlehem Lustre-Die tool steel. That's the grade used by the mold-maker, Charles Zapf & Company, Evanston, Ill., in producing the intricate injection mold illustrated above. They found that Lustre-Die met every requirement, just as Peninsular Steel Co., Bethlehem's local tool steel distributor, said it would.

Lustre-Die is outstanding tool steel for producing plastic parts because its properties enable it to take an unbelievably bright, mirror-like polish. Not only is Lustre-Die the proper analysis for working with plastics—we further enhance it by alloy fortification. The grade is heat-treated by oil quenching and tempering to build up its best properties, and is furnished ready for easy machining and polishing, all set to go.

Lustre-Die is electric-furnace steel, carefully inspected to insure the best degree of cleanliness. It is free from injurious porosity or surface pitting. And as for inclusion-causing additions, there's not a thing to be concerned about.

Plan to try Lustre-Die at your first opportunity. Your Bethlehem tool steel distributor has it in stock, and will be pleased to work closely with you.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

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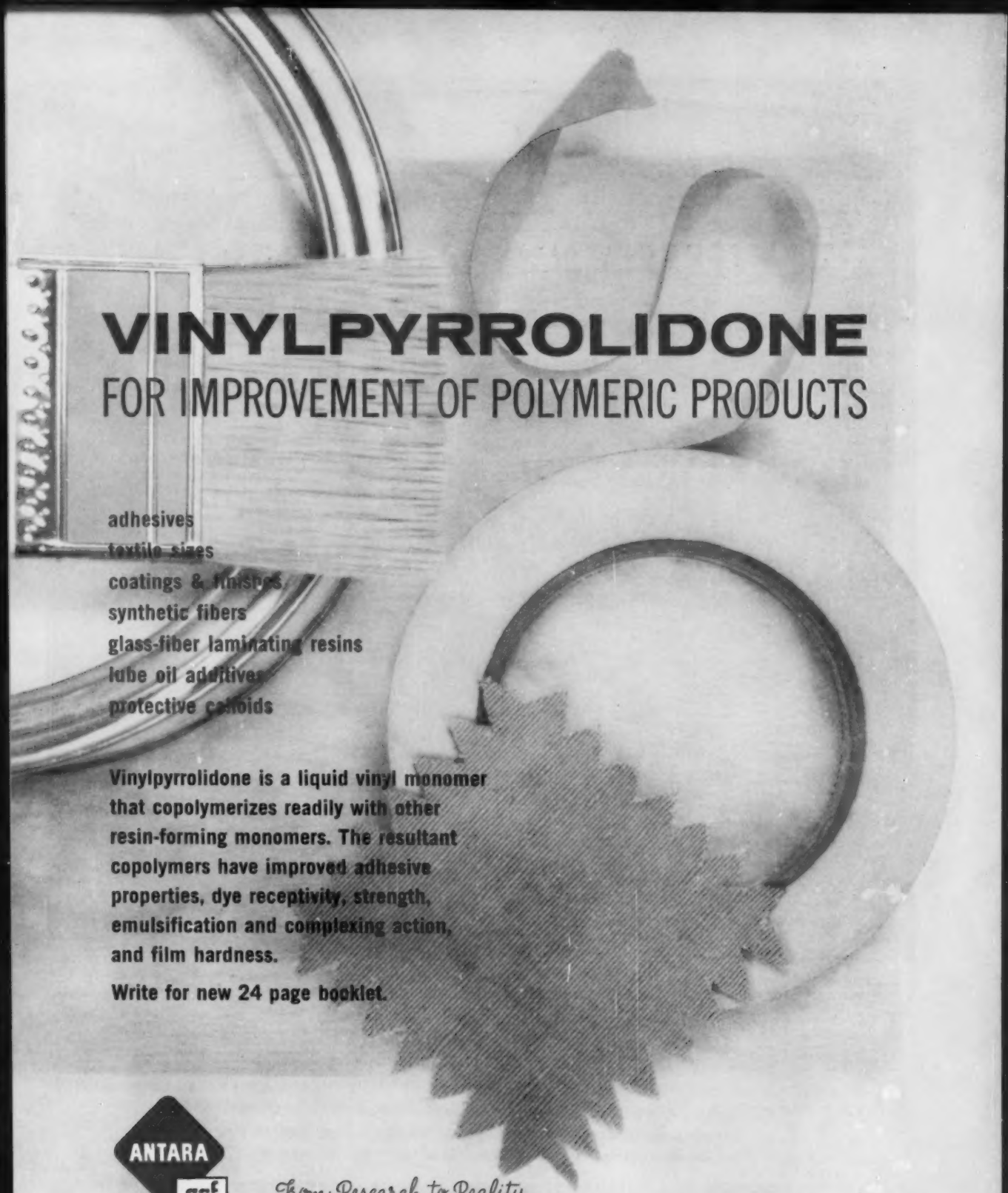
BETHLEHEM TOOL STEELS

BETHLEHEM STEEL



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of fiber glass reinforced plastic products adopt

ISOPHTHALIC based RESINS

Mr. R. S. Morrison, president of Molded Fiber Glass Body Company, has this to say about new ISOPHTHALIC based polyester resins used in their complete line of '58 "MFG" boats.

"Tests made by the Molded Fiber Glass Research Co. proved that an Isophthalic-type polyester resin gave us both increased toughness and increased craze resistance at all normal temperatures. The superior physical properties obtained far offset any cost differential. We have also adopted Isophthalic-type polyester resin in all our automotive applications."

Fast, tough "MFG" 15-footer with revolutionary hull design. Extremely strong and impact resistant.

Frisky 12½ foot "MFG" Corry featuring the famous tough MOLDED FIBER GLASS hull with exclusive lapstreak design.

An Isophthalic-type polyester resin used in the complete '58 "MFG" line offers the dealer and boating public longer-lasting boats that require virtually no maintenance. The new Isophthalic based resin used in their construction provides greater laminate strength plus greater resistance to flexural fatigue.

Isophthalic is a basic new raw material produced by the Oronite Chemical Company. For information regarding its properties and applications, contact the Oronite office nearest you.

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Boost their toughness, weather resistance with "Dutch Boy" basic lead stabilization

Ease production, cut stabilization cost, too!

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With "Dutch Boy" *basic lead* stabilization, rigids are measurably stronger, measurably tougher. Impact and rupture strengths, moduli of elasticity all go up.

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"Dutch Boy" *Dyphos* and *DS-207* stabilizers give you *basic lead* stabilization at its best...plus two-way economy.

First, among stabilizers suitable for high impact rigids, these Dutch Boy stabilizers cost the least to buy... less than half as much. Second, both greatly ease processing.

With "Dutch Boy" *Dyphos* stabilizer, control of process conditions is less critical, color problems reduced. It seizes acid breakdown products, blocks the oxidation caused by working non-plasticized mass at high heat. "Dutch Boy" *DS-207* stabilizer provides continuous, single-phase lubrication, evenly distributed. No melting!

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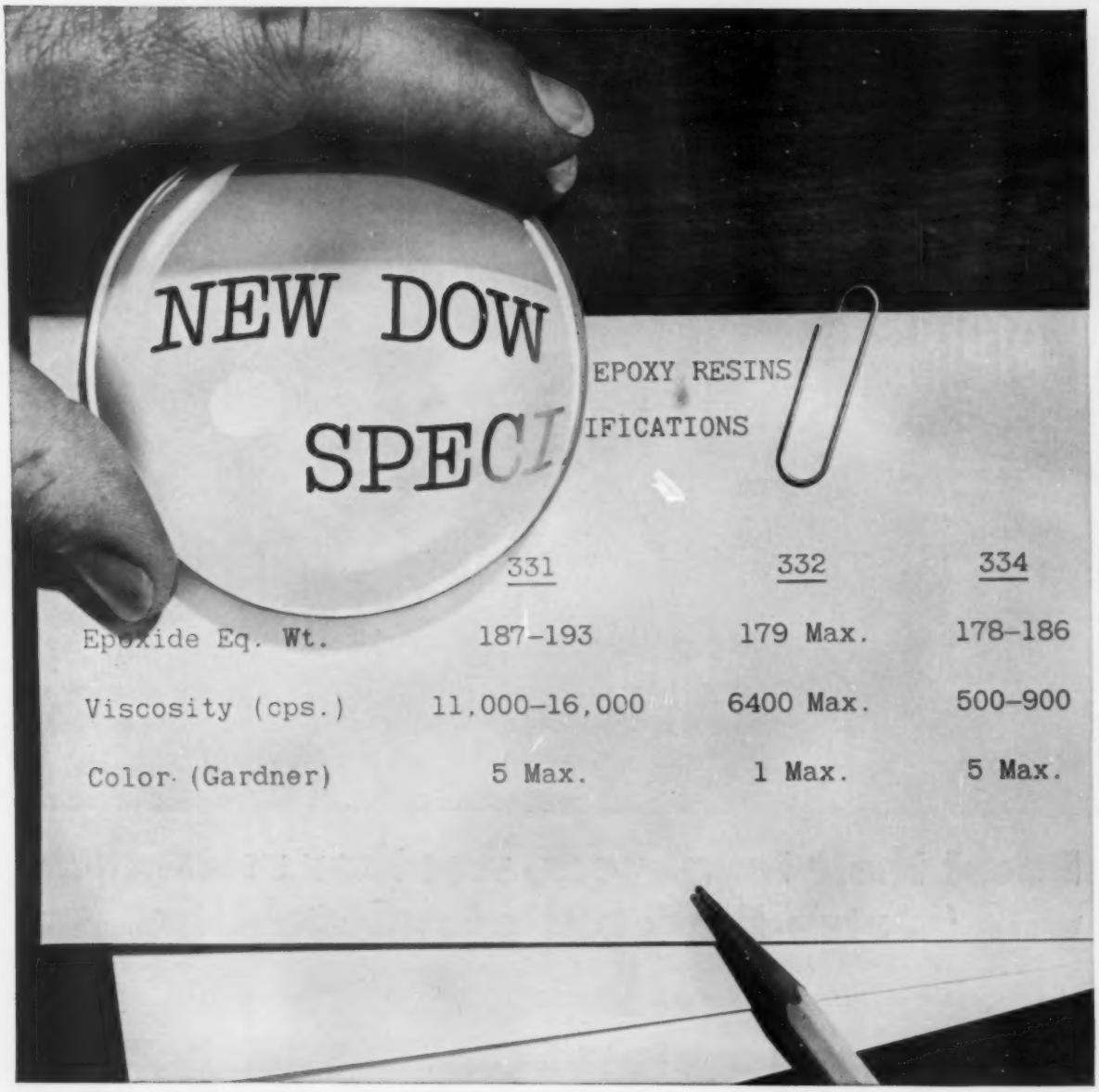


New Dow epoxies feature "lens clear" liquid resin

Dramatic evidence of the striking clarity and purity of Dow Epoxy Resin 332—unique member of Dow's new line of liquid epoxy resins—is shown in the illustration above. The magnifying lens was actually cast from this new water-clear resin. In addition to improved clarity and uniformity, DER 332 has very low viscosity, longer pot life and greater heat resistance than conventional epoxies.

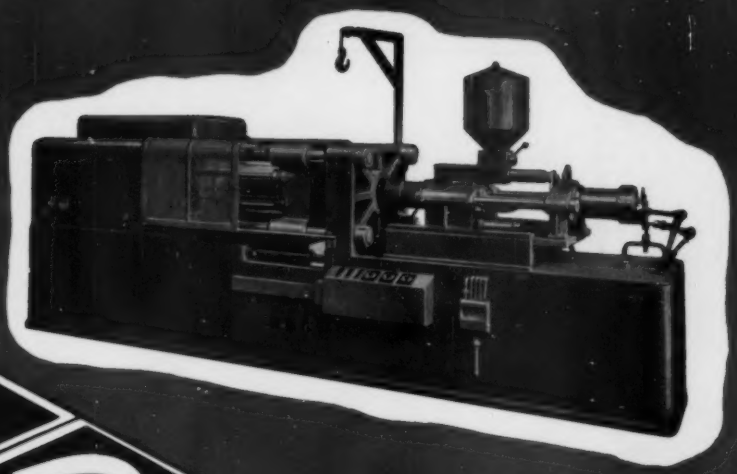
Also available, for formulations where absolute purity is not so important, are Dow Liquid Epoxy Resins 331 and 334.

Dow's position as a basic producer of all epoxy raw materials assures top quality control and a narrower range of specifications. It will also enable Dow to introduce, in the near future, a complete line of solid epoxy resins and a new line of polyfunctional liquid epoxy resins outstanding in high temperature service.

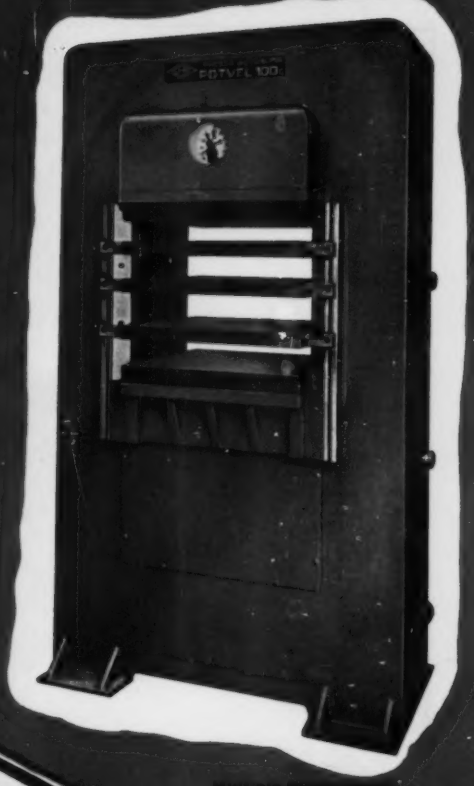
Prompt delivery of these three Dow Liquid Epoxy Resins can be made in drums, truck or tank car lots. For more information contact your nearest Dow sales office or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Coatings Sales Dept. 2259H-1.

EPOXY

YOU CAN DEPEND ON DOW



Injection Moulding Machine
capacity: 1, 2, 4, 6, 10 oz.



Multiple Platen Press
for Rubber and Lamination
capacity: 62, 100, 200, 300, 600 tons

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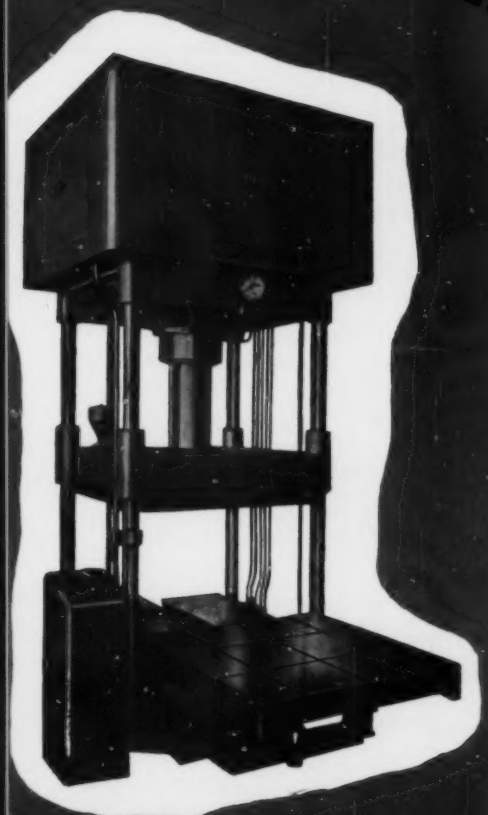
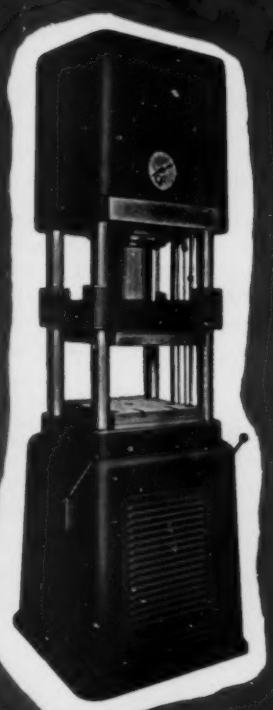
Low Pressure Press for
Reinforced Plastics
capacity: 35, 42, 100, 200 tons





Compression Moulding Press
for Thermosetting Materials
capacity: 25, 63, 100, 160, 270, 500 tons

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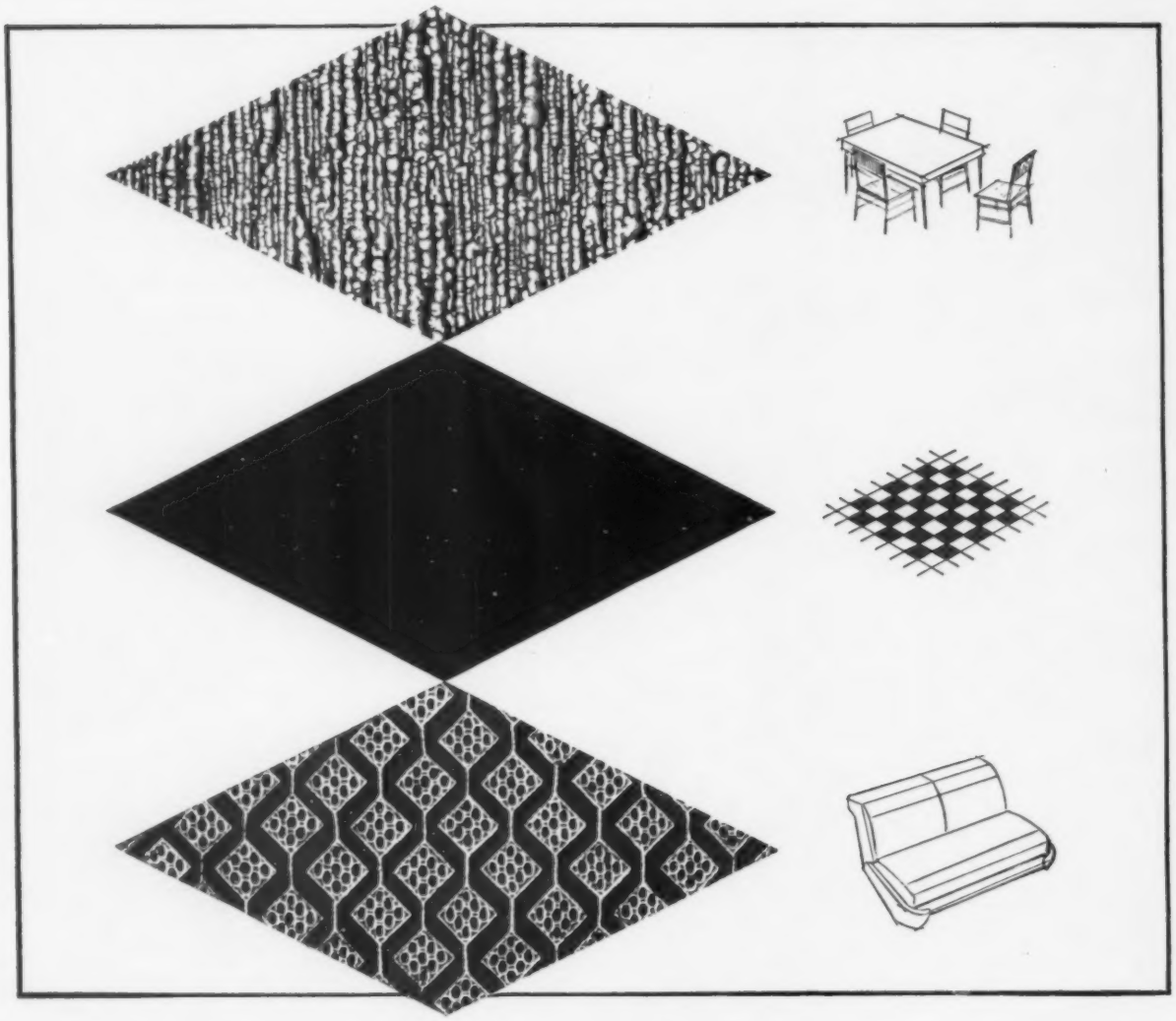
Machines for

Plastic

Materials



Plastolein® 9720 is the answer to low-cost polymeric permanence!

Only a polymeric plasticizer can give your vinyl products the permanence your customers want. And of all polymerics, Plastolein 9720 is the lowest in cost.

You get versatile all-around utility from Plastolein 9720. Outstanding permanence. Easy processability. High efficiency. Excellent compatibility. You get low temperature flexibility that other polymerics fail to match. And the comparatively low viscosity of Plastolein 9720 provides added savings from bulk storage and easy handling.

Remember, Plastolein 9720 gives you polymeric *permanence*, at the lowest possible cost. Get the facts by sending the coupon below.

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Don't miss . . . in this issue

The fantastic story of "heat eating" plastics. They withstand temperatures which would turn most metals into gas! Here are the new, to some extent secret, "exotic" reinforced molding materials used to date largely in the missile and satellite programs, but of direct interest to the aircraft field, the electronics field, and many others. A variety of materials are involved, but the bases are mainly phenolic in structure. The scope of the work is dramatized by the heats encountered: re-entry into the earth's atmosphere by a missile can create temperatures of 20,000 to 30,000° F.! Blast tubes in rockets are exposed to 5000 to 8000° F.! See "NOW . . . into the space age," p. 105.

And then to the other temperature extreme. Wanted: A material for bonding copper, to be used in a liquid-hydrogen-cooled electromagnet, that would provide structural rigidity and electrical insulation at —235° C.! Result: A study of filled epoxy resins at extremely low temperatures. The findings are given in "Epoxy resins as cryogenic structural adhesives," p. 172.

Pearls for processors. The high fines content of PVC dry-blend polymers has perennially caused dusting that means in-plant contamination and loss of material. A new suspension polymer consists of relatively large, spherical, porous particles having no fines at all. These spheres will dry-flow freely after absorbing considerably more plasticizer than conventional resins, can be formulated to desired physical properties, and process easily. There is good news for the vinyl industry in "Dustless PVC eases processing," p. 131.

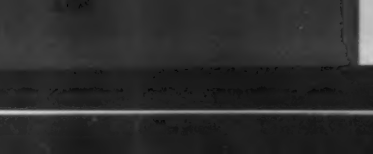
Problems in engineering an automatic plant. Here is a case history of an injection molding set-up which shows that successful planning for automatic molding is not just a matter of ordering machinery and installing it. Everything must be keyed to over-all requirements. The facts about this years-ahead molding department are in "Plant planned for automatic molding," p. 120.

Opportunities for **plastics in furniture** are significantly pointed up by our front cover, designed by Clarence Carter. Furniture makers, historically tradition-bound, were slow to accept plastics. Now, having learned from appliance makers, automobile makers, and others the economical and functional advantages of plastics in furniture, they are forging ahead with new and bigger applications. Almost every plastics material is involved and practically every type of furniture. Resin consumption has been growing every year. Ultimate potential for all materials is high. Read "Plastics' stake in furniture," p. 114.

Polyethylene for **bread wrapping.** Extensive research, both mechanical and chemical, promises to result in a 100 million-lb. market for polyethylene film in many packaging fields. A bread wrap has already been successful in pilot areas. A new medium-density material has been specifically formulated for such applications and machinery has been developed to handle it. See "The polyethylene bread wrap," p. 118.

"Impossible" service conditions. Studies of heat-resistant plastics involve experimental work with sources of high temperatures—solar furnaces, special electric arcs, chemical flames. A technical review of this work and the results obtained gives further insight into the new application areas that are opening up. For interpretation of the data thus far obtained, see the article in Technical Section "Behavior of reinforced plastics at very high temperatures," p. 155.

A new utility copolymer. First used in high-quality dinnerware, a new styrene-acrylonitrile material offers interesting possibilities for injection molders. Its properties of light weight, impact resistance, resistance to staining, and high heat distortion point, as applied in commercial production, are detailed in "New copolymer dinnerware," p. 126.



Watch for . . . an analysis of recent developments in plastics housewares applications in our July lead story . . . reinforced plastics television cabinets and how they compete with other materials . . . a review of plastics tarpaulins and air houses . . . a July engineering article on requirements for resins used in automatic thermoset molding . . . an August feature on the economics of automatic molding of large thermoset pieces . . . a series of case histories of "make or buy" decisions . . . a look at some unusual extrusion applications . . . and more specific information to help you make more profit with plastics.

MODERN PLASTICS

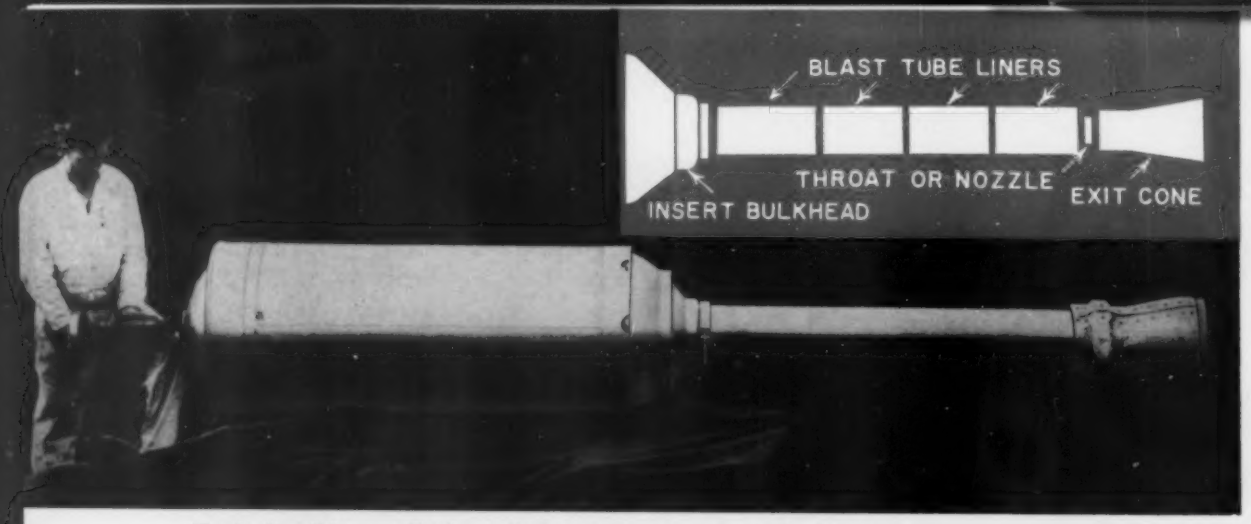
Now... into the space age!

Temperatures up to 30,000° F. are endured by new combinations of materials resulting from research costing hundreds of millions of dollars

The first successful return of a manned vehicle from outer space will perhaps be man's greatest achievement. It is also likely to be an engineering triumph for the plastics industry, because that first space ship will probably use plastics in most of the critical application areas.

Today's new rocket age is already demanding a whole new domain of heat resistance. New combinations of materials, new experimental techniques, and new theoretical concepts are being developed to meet the challenge. Plastics are in the very forefront of heat research. And in work as fresh as today's newspaper, plastics are outdoing all other engineering materials in short-time resistance to the highest temperatures.

The re-entry problem, one of the toughest obstacles in the development of long-range missiles and space vehicles, has already been partly solved with plastics. Re-entry creates heat such as man has never had to deal with before. Temperatures of 20,000 to 30,000° F., three times hotter than the surface of the sun, are generated when a fast moving object



Typical solid-propellant missile has steel motor case; colored inset shows artist's conception of plastics components that make up inner liner

(15,000 m.p.h. and upwards) hits the atmosphere of the earth.

By comparison, the heat in a blast furnace is only 2900° F.; the hottest temperature industry commonly deals with—that of an oxyacetylene torch—is 6000 to 8000° F.

Heat is not the only re-entry problem. There is also the physical shock, which has been compared to ramming a car into a solid brick wall at 60 m.p.h.. Both of these problems have to be solved before a satellite can be returned from outer space. They do not prevent the launching of a satellite, because on the way up a rocket does not move very fast until it leaves the atmosphere.

The two main areas where heat-resistant materials are needed in rocketry are the nose cone, which must withstand the heat of re-entry for short periods of time, and the hot "throat" of a rocket—the blast tube—which must withstand temperatures in the neighborhood of 5000 to 8000° F. for considerably longer, i.e., several minutes. In all high-temperature work, time of exposure is a key factor in the operation.

SPACE AGE GLOSSARY

BLAST TUBE: Extension tube which carries thrust gases from combustion chamber to exit cone.

COMBUSTION CHAMBER: Section of missile in which fuel is burned.

EXIT CONE: Funnel-shaped part at rear of missile through which hot propulsion gases are discharged.

FLAME DEFLECTOR: Used to deflect hot gases away from particular area for protective or stabilizing purposes.

INSERT BULKHEAD: Funnel-like part which concentrates propellant gases. It links combustion chamber with blast tube.

JETEVATOR: Cup-like device which moves in and out of jet stream to create drag for guidance.

JET VANE: Guidance fin located in stream of exhaust gases.

MOTOR CASE: Steel shell encasing propellant and thrust system of missile.

RUPTURE DISK: Disk which is broken at pre-set time to change either direction or power of missile thrust.

THROAT or NOZZLE: Part which concentrates gases before they enter exit cone.

Phenolic the star

The star performer in this hot arena is phenolic resin. This workaday thermoset has earned a glamorous new role at the very top of the list of hot-service materials. Phenolic, and to a lesser extent, the epoxies, used in combination with various reinforcements, are performing in actual applications that would vaporize steel, and where all other materials would break down. At 3000° F., metals melt because of their high heat conductivity (100 times higher than plastics); most ceramics cannot resist thermal or mechanical shock; carbon type materials, such as graphite, burn rapidly in the presence of air.

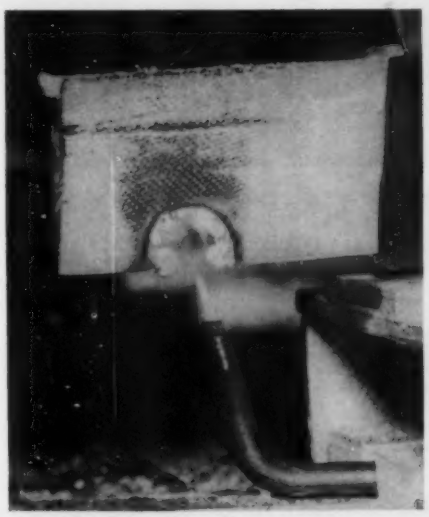
But at ultra-high temperatures, phenolics accomplish their miracles by "erosion" or "ablation." These words have special meanings in rocketry; they describe the technique whereby the hot side of a plastic material disintegrates or "erodes" under heat exposure, while enough material on the cold side remains structurally sound—and cool enough because of low thermal conductivity—to do the job.

In this context, the word "erosion" must not be confused with the eroding effect of gases moving at high velocity over a surface. This is called "aerodynamic sheer stress," and it presents a related but separate problem to the missilemen.

An erosion material can be thought of as functioning in three layers: the outside surface erodes; the next layer, remaining intact, insulates the third layer, which is actually the structural element.

By use of the erosion principle, missile nose cones of filled phenolic have successfully returned through the atmosphere, reaching between 20,000 and 30,000° F. for more than 20 sec., and landed with sufficient material left to keep electronic instruments inside the cone under their safe operating temperature ceiling of 250° F.

In general, the new high-temperature materials consist of an organic resin base (usually phenolic) filled with a high-melting-point inorganic silicate (glass, asbestos, or quartz). On exposure to high temperatures, the organic resin binder may at first undergo further cross-linking, thus gaining even greater heat resistance. Then the surface layers begin to pyrolyze actively, causing flaking off—erosion—of the surface. The exposed silica fibers melt to form a highly reflective, vitreous surface. (See photo, p. 108). This surface resists further erosion and conductance of heat while, at the same time, it reflects most of the heat energy away from the surface.



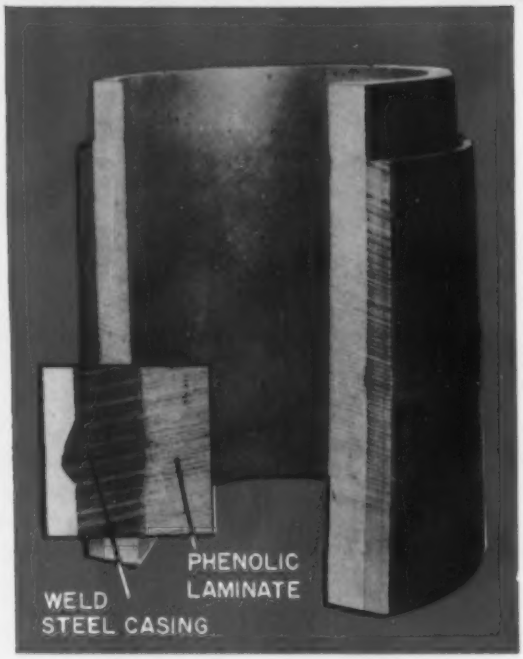
Heat resistance of epoxy-based laminate under test with oxyacetylene torch. Photographed through filter to subdue glare. (Photo, Aerojet)

Carbon arc capable of producing 26,000° F., among latest tools of heat research, is used to test a nose-cone-shaped plastic specimen. (Photo, General Electric Co.)

The choice of reinforcement depends on the specific application. Not enough is yet known for design principles to be laid down but a few general rules have emerged.

Asbestos fibers seem to hold up best on exposure to hot gases moving at high speed, such as in a rocket's blast tube. Glass (or quartz) cloth yields higher physical strength, but gases moving at high Mach numbers are likely to tear off pieces of the structure. Glass rovings, which are the simplest and cheapest filler materials, lack structural strength, but perform well in certain applications. Also, it has been found that different results can be obtained by varying the filler arrangement and the ratio of resin to filler.

In addition to resins and reinforcements,



High-heat-resistant reinforced phenolic liner for missile blast tube is not affected by heat (3000 to 4000° F.) required for welding of outer steel casing. (Photos, Haveg)

Eroded surfaces of leading edge of jet vanes from successfully fired missile shows as shiny area which resists further heat conduction and also acts as heat reflector

exotic additives such as boron and oxides of titanium are definitely in the picture. But exactly how they fit—where they are used, what they do—is classified information, in terms of both U. S. security and plain competitive business. As a matter of fact, this is true of much of the high-temperature field, inevitably tied to the rocket program. No one can tell all he knows.

Nose cones, blast tubes, and a host of other missile parts—insulators, insert bulkheads, jet vanes, jetevators, motor cases, rupture disks, and throats (see glossary, p. 106)—are being manufactured of reinforced phenolic on a production-line basis today.

Missile work is already big business—though more in terms of dollars than volume of materials used. These highly-engineered parts cost from $5 to $25 a pound in the finished state, depending on tooling costs.

Two of the leading reinforced plastics firms in this work are Haveg Industries, Inc., Wilmington, Del., and Cincinnati Testing and Research Laboratories, Cincinnati, Ohio.

Haveg, with its Norwalk, Calif., subsidiary, Reinhold Engineering and Plastic Co., is producing parts for 17 different missiles, including one unit for which Haveg makes seven different parts. The company has its own proprietary cold molded asbestos-filled phenolic, which is shaped while cold and later cured in an autoclave. Because of Haveg's production methods, size is no limiting factor; molded assemblies have been produced up to 42,000 lb. in weight and 12 ft. in diameter. Haveg, headed by John H. Lux, has developed a whole galaxy of high-temperature materials with astronomical names (Planeton, Missileon, Galaxon, Mercurno, etc.), using furane, silicone, and phenolic resins, and many types of fillers.

Production method

Here is the method Haveg uses to produce a blast-tube liner for a sizeable, volume-production missile: the phenolic, filled with short-fiber asbestos, is worked in the cold state onto a spinning steel mandrel. This orients the fibers circumferentially around the liner. After the putty-like compound is built up to the proper thickness, the coated mandrel is put into a huge autoclave for cure. Then the steel form is removed by means of a special mandrel puller (see photo, p. 109) and the liner is cut into four separate parts. These are machined to very close tolerances (±.002 in. on a part 17 in. long, 8 in. in diameter) on special lathes.

All-plastics missiles

In addition to this military work, Haveg is doing experimental work on an all-plastics missile. The concept is based on the high structural strength to be obtained from filament-winding, a technique by which impact strengths approaching that of 4130 steel can be achieved. (See MODERN PLASTICS *34*, 132, March 1957). If successful, a plastics missile could be manufactured for ½ to ⅒ the cost of some present missiles, according to the company.

Douglas Aircraft Co., Santa Monica, Calif., has also carried out preliminary work on an all-plastic missile. The chief drawback, reports Douglas, has been the low elastic modulus of phenolic and epoxy laminates.

The most dramatic contribution of Cincinnati Testing and Research Laboratories to rocketry is the 400-lb. phenolic-inorganic filler nose cone of an important classified IRBM. The cone is made up of 16 sections, compression molded in a special press, which are later bolted to a framework and cemented together with an epoxy adhesive. This adhesive is the weak point in the structure, but under re-entry stress and temperature the phenolic "smears" to protect the cemented seams.

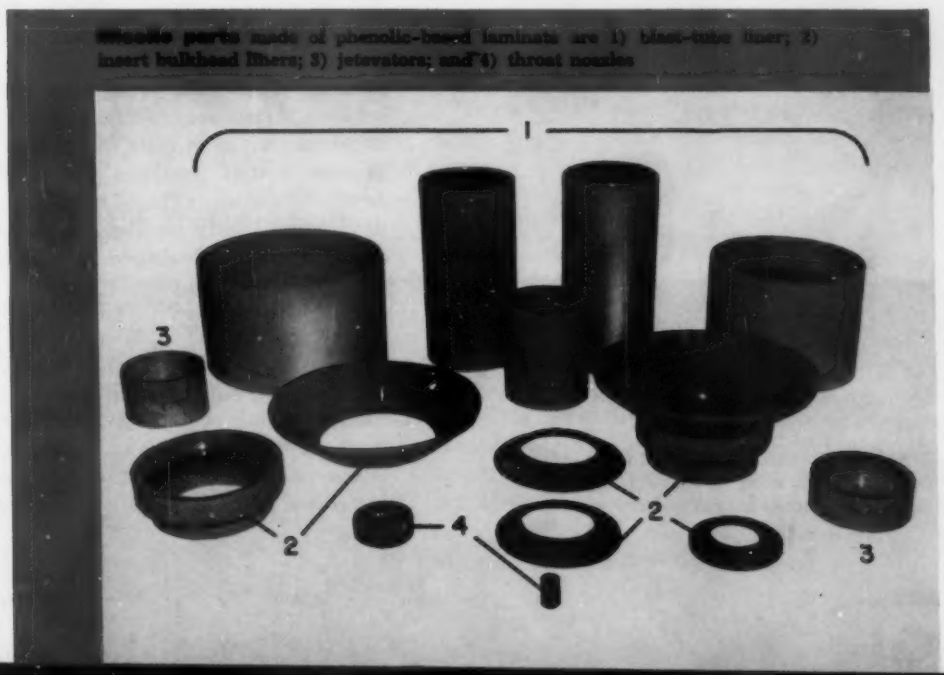
Cincinnati Testing, under Elmer Warnken, is one of the pioneers in the high-temperature field. Besides nose cones, the company produces motor components, wings, fins, and other parts for U. S. missiles. To produce these specialized parts, the company uses special production methods, such as two-stage curing: the parts are given a very "light" cure (260 to 280° F.) in the compression press, followed by a very long and carefully controlled postcure to achieve maximum cross-linkage. For instance, a ⅛ in. thick phenolic laminate might be cured for three days, with temperature progressing from 350 to 450° F.

Other materials

Epoxy resins are of great interest as high temperature materials. Aerojet-General Corp., Azusa, Calif., rocket-building subsidiary of General Tire & Rubber Co., has done a great deal of work with them. After extensive testing with an oxyacetylene torch, Aerojet developed two experimental modified epoxy materials, E602, a laminating resin, and a modified epoxy molding compound, E702. In other Aerojet tests, a modified epoxy, Aerorez E601, demonstrated superior self-extinguishing characteristics. An attractive feature of epoxy is that as an addition polymer it does not emit volatiles in curing, tends to shrink less than phenolic, and provides fabrication advantages.

According to George Epstein of Aerojet's Structural Plastics Div., one of the reasons phenolic has been used so extensively in ultra-

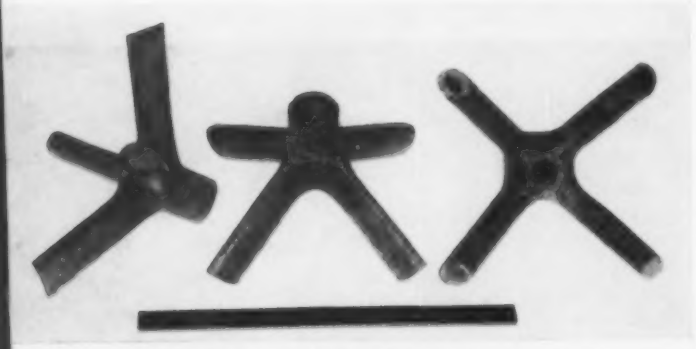
Cured reinforced plastics blast-tube liner being removed from mandrel on which it was formed prior to machining. (Photos, Haveg)



Missile parts made of phenolic-based laminate are 1) blast-tube liner; 2) insert bulkhead fillers; 3) jetevators; and 4) throat nozzles

high temperature applications is a long-time familiarity by the plastics industry which epoxies do not yet enjoy. Aerojet has fabricated many rocket and missile parts of epoxy (as well as phenolic), including impinging cones, blast tube liners, nozzle adaptor insulators, grain support structures, and jeterator parts.

The silicones, with the same reinforcing materials used with phenolic, have a certain valuable temperature plateau of their own. On "long term" heat resistance—meaning dozens to hundreds of hours—and in the vicinity of 600 to 900° F., they seem to perform better than phenolic, though their room-temperature physical properties are poorer. Goodyear Aircraft Corp., Akron, Ohio, a leading manufacturer of reinforced plastics radomes, has turned to a silicone-glass composition to develop an operational radome which can withstand 875° F. in flight. Goodyear is working to develop radomes that will withstand higher temperatures, now that emphasis has gone from aircraft to missiles. Most missiles use some kind of guidance system which must be housed in electrically transparent radomes. In connection with its high-temperature work, which also extends to the phenolics, other plastics, and other missile applications, Goodyear has developed a quartz-lamp test facility that can heat samples as high as 2500° F. at rates up to 400° F. per second.



Reinforced plastics grain supports insulate metal structures from heat (up to 8000° F.) of erosive gases in a solid-propellant rocket motor. (Photo, Aerojet)

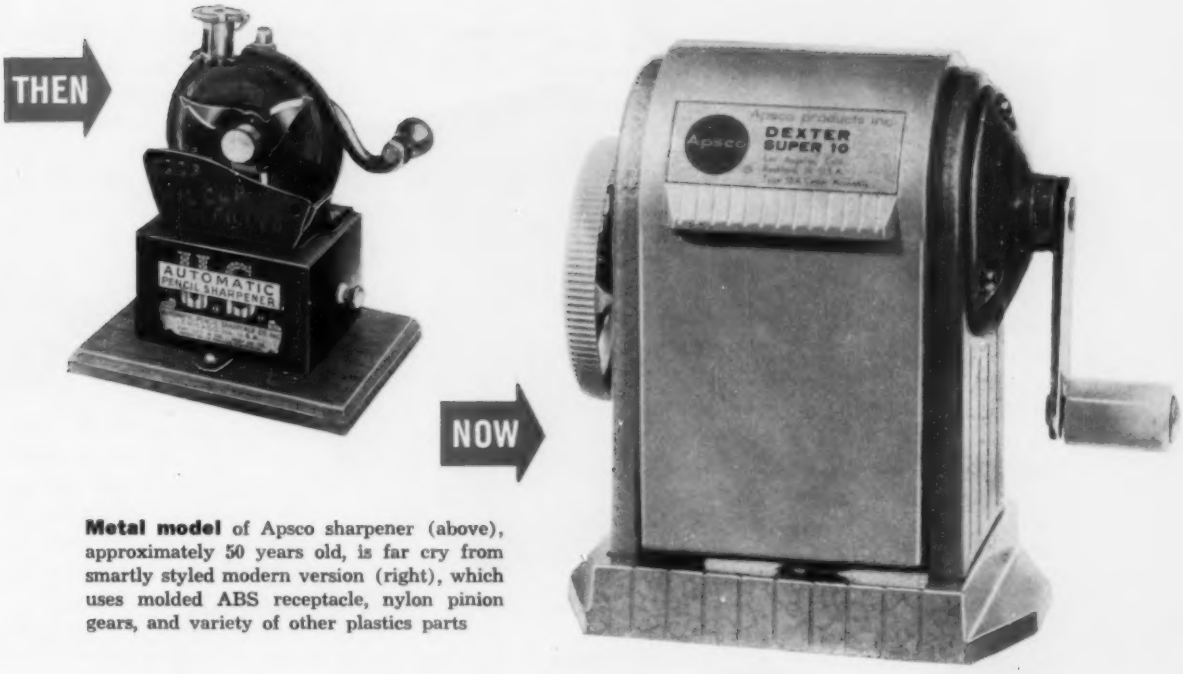
Liner for rocket motor is made of epoxy-based material, must withstand over 3000° F. for several seconds in high-velocity gas stream

Several firms other than those mentioned above are in the picture. Plastic Age Sales Co., San Fernando, Calif., is compression molding huge rocket motor insulators which must withstand temperatures in the 5000° F. range, using phenolic materials supplied by Fiberite Corp., Winona, Minn. Continental-Diamond Fibre Corp., Newark, Del., manufactures a felted-asbestos base high-temperature phenolic laminate in sheet and rod form which can be fabricated by conventional metal-working methods. CDF, which also supplies finished parts, is evaluating its materials for applications in the chemical, electrical, and electronic industries. Four other high-temperature materials suppliers are Coast Manufacturing and Supply Co., Livermore, Calif.; H. I. Thompson Fiber Glass Co., Los Angeles, Calif.; Narmco Resins and Coatings Co., Costa Mesa, Calif.; and U. S. Polymeric Chemicals, Inc., Stamford, Conn.

These companies, using their expert knowledge of thermoset chemistry, have made phenomenal strides in spite of the vast blanket of ignorance that insulates the whole field of heat resistance. They have succeeded in developing highly sophisticated materials with relatively crude tools—a little like creating a Rembrandt with a paint roller.

Lack of knowledge

When the world shot into the missile age a few years ago, it found that science knew virtually nothing about high heat. Accurate test methods were non-existent; samples tested by exposure to a jet blast or an oxyacetylene torch could only be (*To page* 218)



Metal model of Apsco sharpener (above), approximately 50 years old, is far cry from smartly styled modern version (right), which uses molded ABS receptacle, nylon pinion gears, and variety of other plastics parts

Pencil sharpeners turn to plastics

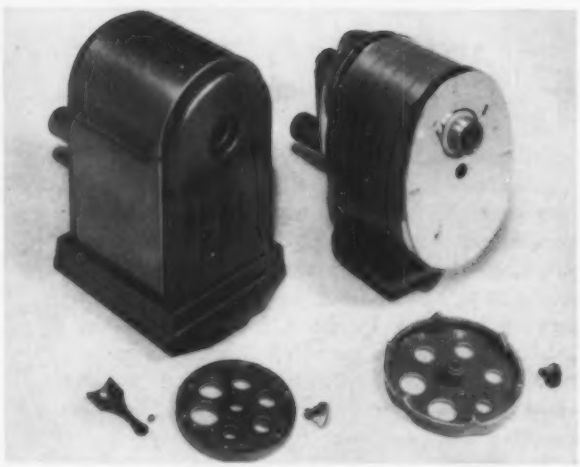
Replacement of many metal and wood parts by styrene, ABS, nylon, and acrylic pays dividends in appearance, durability, and performance

The nation's largest producer of automatic pencil sharpeners is turning increasingly to injection molded plastics to replace components long made of wood or metal. Four plastics—high-impact styrene, ABS (acrylonitrile-butydiene-styrene), nylon, and acrylic—are involved in this continuing product improvement program by Apsco Products, Inc., Los Angeles, Calif. Components involved include handle knobs, pinion gears, indexing chucks, which adapt the sharpener to pencils of different diameter, and pencil shaving receptacles.

Despite the inroads of ball point pens and liquid lead pencils, wood cased lead pencils are still being turned out at a rate of some 1½ *billion* units per year. It takes many thousands of office-type pencil sharpeners to keep pencils sharp in schools, offices, industrial plants, institutions, etc.

Although its use of molded plastics parts dates back only to 1955, Apsco has already realized several important dividends from the changeover. In addition to the inherent color range of plastics—particularly desirable because the company manufactures a number of private brand sharpeners as well as its own complete line—Apsco finds that the plastics components have enabled it to build improved appearance and performance, greater durability, and all-round higher quality into its sharp-

High-impact styrene receptacle in choice of colors is used on popular line of sharpeners



Two types of adjustable chucks used on sharpeners. Die-cast metal chuck (left) requires spring steel clip and ball bearing mounted in end plate for indexing. Molded nylon chuck (right), fastened from inside with thread-cutting screw, is sufficiently flexible to index without need for spring or steel ball

eners without materially increasing its production costs.

Some assembly operations have also been simplified because the plastics parts eliminated the need for additional components required in earlier models.

Today's colorful, functionally styled Apsco sharpeners, designed by Vytant Aleks are a far cry from those made half a century ago, when Automatic Pencil Sharpener Co. (now Apsco Products, Inc.) received the first patent covering a mechanical pencil sharpener. These pioneer models were made of metal and wood.

Historically, Apsco's first use of plastics goes back nearly 50 years, when cellulose nitrate sheeting was used to provide transparency in sharpener receptacles. About 10 years ago, a switch was made to cellulose acetate, which is still in use on one model.

First of the molded plastic parts adopted by Apsco is the nylon chuck, a disk-like component having a series of six openings, of different size, to guide pencils of various diameters into the cutting head. The present selector dial chucks, molded of gray nylon, are approximately 2⅜ in. in diameter. They are molded with a series of six equidistantly spaced triangular teeth extending from the inner lip and an equal number of finger grooves around the outside edge. A blind cored boss is molded on the inside center surface of the chucks, so they can be mounted from the inside with a self-tapping screw.

Safe from prying fingers

This arrangement not only eliminates the need for a spring steel retainer and ball bearing, as required with the metal chucks, but also the use of an exposed bolt. Thus, while

simplifying assembly, the new nylon chuck foils the prying fingers of school children who delight in taking things apart.

The need for a ball bearing and spring retainer to index the position of the rotatable chuck is eliminated because of the resiliency of the nylon. As the chuck is "dialed" to each position, the locating teeth seat firmly at each location in dimples formed in the metal and plate.

Next to be converted to plastics were the handle knobs, which are now produced in a 40-cavity mold. These are injection molded of gray or black high-impact styrene. Now used on the company's complete line of sharpeners, they replace the wooden handles formerly used, which were made by a lathe operation and required spray painting. Unlike their wooden counterparts, the plastic knobs are immune to splitting or breaking; furthermore, the integral color cannot wear off in use.

The first plastic receptacles adopted by Apsco were molded of high-impact styrene. These receptacles, in a choice of red or yellow, are used on Apsco's Midget model sharpeners and, in other colors, on some of the private brand sharpeners. These colorful, sturdy components are made with two internal cross ribs having cored openings at the end, permitting attachment of a stamped sheet metal end plate with self-tapping screws.

Next to be introduced was the injection molded ABS hinge-style receptacle used on the company's Dandy, Dexter, and Draftsman model sharpeners. These receptacles are unconditionally guaranteed against breakage. They are so sturdy that they may be hurled against a wall or stood upon without damage. In a dramatic demonstration, one of these receptacles was placed under the rear wheel of a 2500-lb. motor car and emerged unharmed except for minor scratches.

The ABS receptacles, molded in a metallic gray, are produced in two halves which are assembled at the back by means of a spring clip. Top and bottom sections of the receptacle have mating tongue-and-groove edges at the back which give the hinge a smooth, trouble-free action. Engraved (*To page* 221)

Representative pencil sharpeners and their plastics components, including (left to right) two-piece hinged molded ABS receptacle, impact styrene handle knobs (replacing wood), nylon chucks, and impact styrene receptacle. Pencil at right foreground points to position of molded nylon pinion gears in cutter head assembly. Also shown are some nylon gears and metal die cast gears they are replacing

PLASTICS' STAKE

Current sales volume of the U. S. furniture industry at wholesale is estimated at an annual $2 billion. Of that total, plastics account for about 5%, or $100 million. Volume-wise, the furniture industry consumes close to 150 million lb. of resin.

While a 5% market penetration may not seem to be a significant achievement, it assumes added importance in this instance because it marks the take-off point for an anticipated healthy growth.

The outstanding fact about plastics' present status in furniture is that they have become trend-setters and upgraders. Increasingly they are being incorporated in the advanced designs of today; and as these designs turn into the mass product of tomorrow, plastics' share of the market will increase many-fold. Here are some examples:

▸ Designer Eero Saarinen called on molded reinforced plastics shells to contribute durability and grace to a line of dining room pedestal furniture recently introduced by Knoll Associates, Inc., New York, N. Y., and already enthusiastically received by interior decorators.

▸ New York City's Hotel Manhattan recently specified decorative laminates for the case goods in refurbishing all of its 1400 rooms. The furniture, made by Grand Rapids Bookcase & Chair Co., required about 100,000 sq. ft. of laminate made with American Cyanamid melamine resins, and represents the most advanced approach to hotel decor to date. The beauty of the material; its stain-, burn-, and scuff-resistance; its minimum maintenance requirements; and its long service life, all made it ideal for this application.

▸ Folding tables produced by Shwayder Bros., Detroit, Mich, under the Samsonite label, now are made with tops of vinyl-metal laminate for light weight, toughness, and beauty.

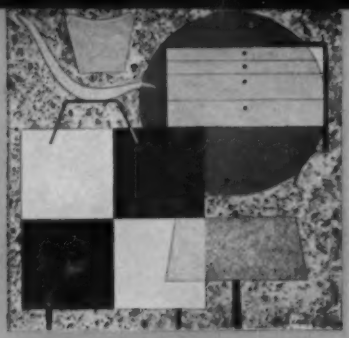
▸ The latest in kitchen furnishings involves Goodyear's Videne polyester film. Laminated to styrene sheet and then vacuum formed to desired contours by the Panelyte Div. of St. Regis Paper Co., New York, N. Y., the material is used to make cabinet doors in French Provincial, Modern, and other styles. The doors are part of the Dimensional Kitchen produced by Raygold Industries, Inc., New York, N. Y.

There is another important fact: while penetration is only 5%, it is all-pervasive. There is

Exciting desk design includes striking white decorative laminate top. Office and institutional furniture is a major outlet for the material. (Photo, General Fireproofing)

IN FURNITURE

Facts and figures show how plastics are upgrading many phases of the furniture industry, bringing added advantages of production economies for the manufacturer and better service for the consumer



today no group of furniture that does not use plastics; conversely, there is no group of commercial plastics (except possibly fluorocarbons) that has not found some application in furniture. Present plastics usage and prospects by furniture groups is as follows:

Case goods

Decorative laminates: Total production for this material in 1957 is estimated at close to 200 million sq. ft., involving approximately 15 million lb. of melamine and 35 million lb. of phenolic laminating resins (solids basis). About 75% of decorative laminate production goes into furniture; the remainder finds its way into doors, walls, and miscellaneous uses.

It is noteworthy that these laminates, which

Circular coffee table produced by Drexel Furniture Co., has lusterless melamine decorative laminate top. Retailing at about $125, it is representative of the type of high-fashion home furniture in which these laminates have found application. (Photo, Monsanto)

Pedestal dining room chairs provide comfort and elegance thanks to reinforced plastics shells. (Photo, Knoll Associates, Inc.)

Bedstead and night table in New York's Hotel Manhattan are laminate surfaced. Headboard is upholstered in vinyl. Ease of maintenance offered by both materials makes them ideally suited for the vast institutional market. (Photo, American Cyanamid Co.)

have so long been stuck in the kitchen, are now moving into luxury line markets, especially on occasional furniture—coffee tables, end tables, etc. Drexel Furniture Co., Drexel, N. C., for example, is producing a circular coffee table retailing at about $125. The top surface is made of *lusterless* laminate, overcoming a long-standing consumer objection to the high gloss characteristic of designs previously available. Dunbar Furniture Corp. of Indiana, Berne, Ind., is offering a laminate-top lamp table at $309 and a matching coffee table at $260 (retail).

The material, however, has not given up the low-priced field: Heywood-Wakefield Co., Gardner, Mass., makes an ash-grain coffee table that retails for about $35.

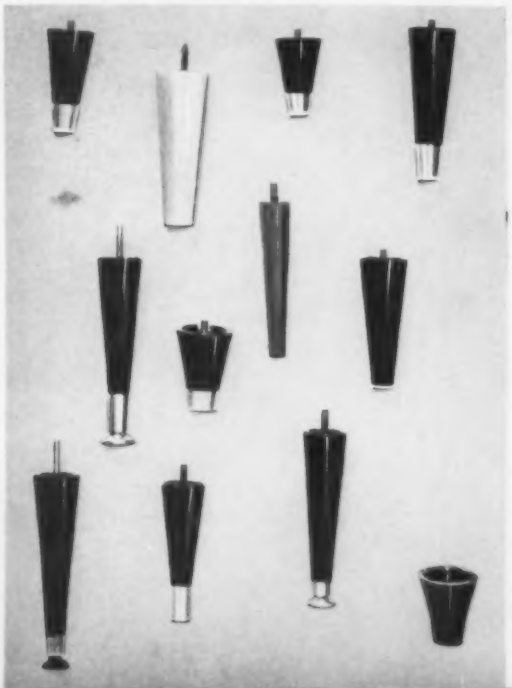
Office desks have also become a major outlet for the material. Among the latest examples is an 80-in. desk with white laminate top produced by General Fireproofing Co., Youngstown, Ohio.

Current price for decorative laminate is roughly 70¢/sq. ft. Good-quality veneer goes for about 80 cents. In addition, the laminate's physical properties are superior; it offers considerably more design latitude; and it requires no polishing operations.

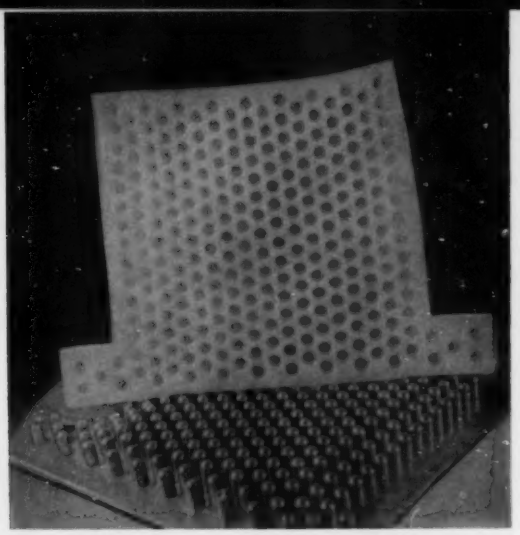
Chipboard and plywood. Over 50 million lb. of resins go into the manufacture of chipboard and plywood annually, most of it urea and phenolic, with a small amount of melamine. Over 50 million sq. ft./year of chipboard and 100 million sq. ft. of hardwood plywood are currently being used by the furniture industry. The big advantage offered by chipboard as a core material is that it is only about half the price of yellow poplar lumber core stock—14¢/sq. ft. against 27¢, for ¾-in. stock. The benefit offered by plywood—which sells for about the same price as yellow poplar—is that it does not require veneering.

Drawers: The situation in plastic drawers has consistently improved since last October when MODERN PLASTICS surveyed the subject. The number of drawer molds—and sizes—will

Molded impact styrene legs on display at the 1958 International Home Furnishings Show in Chicago, range up to 28 in. high and 3 in. in diameter. Resin consumption for this application is expected to reach 3 million lb. by 1960. (Photo, Monsanto Chemical Co.)



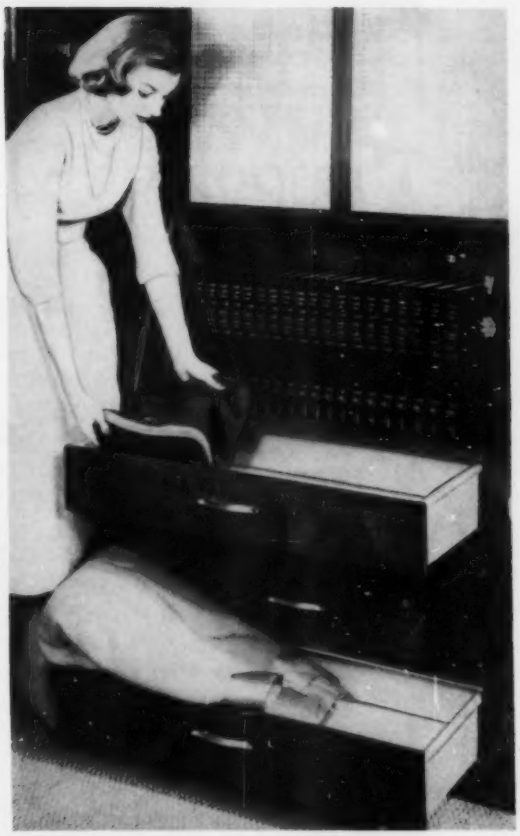
Sofa cushion being filled with polyether-urethane foam at Shaw Mfg. Co., Charlotte, N. C. About 125 manufacturers are using urethane foam for cushioning. (Photo, Du Pont)



Cored cushioning material can be molded of vinyl foam on a production basis. Coring adds softness to cushion, lowers material cost by up to 50%. (Photo, Bakelite)

probably reach 50 by the end of 1958, against 25 last October. Almost all the increase will be accounted for by molded and formed styrene drawers. Both Amos Molded Plastics, Edinburg, Ind., and Prolon Div., Pro-phy-lactic Brush Co., Florence, Mass., are cutting additional injection molds; and St. Regis Panelyte Div. has been adding to its stock of vacuum forming molds. Resin consumption for this application was roughly 1.5 million lb. in 1957, styrene and phenolic (*To page* 222)

Chipboard surfaced with decorative laminate being fabricated into table tops. Chipboard uses large quantities of urea and phenolic bonding resins. (Photo, Weyerhaeuser)



Plastics drawers bring production economies to the furniture manufacturer and numerous advantages to the homemaker. Drawers are being molded of styrene and phenolic and formed of styrene sheet. Total resin consumption by the end of 1958 is expected to reach a 3 million-lb./year rate. Drawers in Drexel unit above are molded of styrene by Prolon. (Photo, Monsanto)

Transparent medium-density polyethylene wrapper for specialty bread is about 1 mil thick. Coated end label makes it easy to open the package

The polyethylene bread wrap

Development of machinery and film opens up new market with tremendous potential

Another milestone to mark the ever-expanding growth of polyethylene film was set up recently when Crown Zellerbach Corp. announced the successful development of a polyethylene bread wrapper. This is the second important news concerning polyethylene bread wrappers to be disclosed within the past few months. The first was a Visking-Milprint announcement concerning production use of a combination polyethylene-wax paper wrapper.

The Crown Zellerbach film, called Crown-Seal, is now being used for wrapping specialty breads by Fluhrer Baking Co., Eureka, Calif. It is produced from an intermediate- or medium-density resin formulated by Spencer Chemical Co. The machine on which the film is wrapped is standard equipment with a $1500 attachment which does not hinder use of the same machine for handling cellophane or waxed paper.

The polyethylene film used for the wrapping is 25 to 35% cheaper than cellophane bread wraps. Total packaging cost when using Crown-Seal film and special end labels and inserts which have also been developed will run 11 to 20% below that of cellophane. Comparative costs with wax paper wraps are not yet available, but for the time being, at least, the polyethylene wrap will be used only for specialty breads now using transparent cellophane.

Other advantages claimed for the new wrapper as compared with cellophane are that it is easier to open and makes the wrapped bread feel softer and fresher longer.

Significant factors

Some of the most significant factors involved in this new bread wrapping achievement with Crown-Seal are: development of the attachment which permits sealing of the wrapper; formulation of a resin with special properties needed for this particular application; and successful techniques for extruding the film.

Patents have been applied for to cover the attachment, end labels, and insert band used with the wrapper. Consequently few details are

yet available. However, it is known that the attachment is designed to use Teflon coated moving belts and rollers for handling the specially coated end labels. Special heat controls are used to modify those on the wrapping machine to give a tolerance of ±25° F., which is more narrow than that used for waxed paper or cellophane wrapping. The attachment for the machine will be sold initially by Western-Waxide, a division of Crown Zellerbach that developed the equipment. The paper end labels and insert band are coated with special materials. The end labels serve as tear openers to help overcome the tough polyethylene seal and speed opening of the package. The polyethylene wrapper is tack sealed first and an end label applied by sealing.

The film used for this application appears to be about 1 mil thick. It has been extruded by all methods, but the best results were obtained with special take-off equipment. Further work on extrusion techniques is being carried on.

Since all the parties involved in this film development insist that the resin used is a *modified* intermediate-density material, it seems safe to guess that it is less than 0.935—perhaps something in the range of 0.930.

It is no secret in the trade that polyethylene films in the density range of 0.927 to 0.935 are now being used in fair volume for flat wrapping of textiles and a few other items. The cost of these resins up through 0.929 density is 35¢/lb., but those of 0.930 and up are a few cents higher. One of the principal reasons for using them in textile and paper product wrapping (plates, napkins, etc.) is their superior clarity. They have not been widely used in bags. However, they have made little progress in food and bakery goods wrapping because they present handling and sealing problems on standard wrapping equipment. The Zellerbach development is designed to ameliorate these difficulties.

Another significant factor is that this development gives a big boost to the potential market for high-pressure-processed intermediate-density resins which up to now have been confined to comparatively small volume consumption. Probably less than 10 million lb. of the 0.930 to 0.935 resins were sold in 1957 out of a total polyethylene film volume of over 200 million pounds.

Specially tailored resin

There seems to be no question but that Spencer has specially tailored its intermediate-density resin for this application. In addition to clarity, the film has properties upgraded from conventional resin to obtain the following particular advantages: a stiffness that is twice that of a lower density resin; better surface gloss; less permeability—to moisture vapor transmission and lower permeability to gases; improved slip and block resistance characteristics—that is, slip for high speed handling without excessive blocking but just enough block to prevent sliding. All these properties can be obtained from intermediate-density resins, but they vary according to the density.

In a talk before an S.P.E. group last fall, Fred Sutro of Spencer quite clearly pointed out the difference in intermediate-density resins. He stated that these property variations are apparent between higher and lower density materials when there is a difference in density of three or more units (0.003) in the third decimal place. But some properties, he said, such as permeability, change rapidly over a small density range and then remain almost constant. He also pointed out that problems such as degradation of impact strength when density is increased are encountered in higher density materials. Another (*To page* 227)

Flexibility of polyethylene film makes tight reseals possible, keeping the bread fresh for longer periods of time

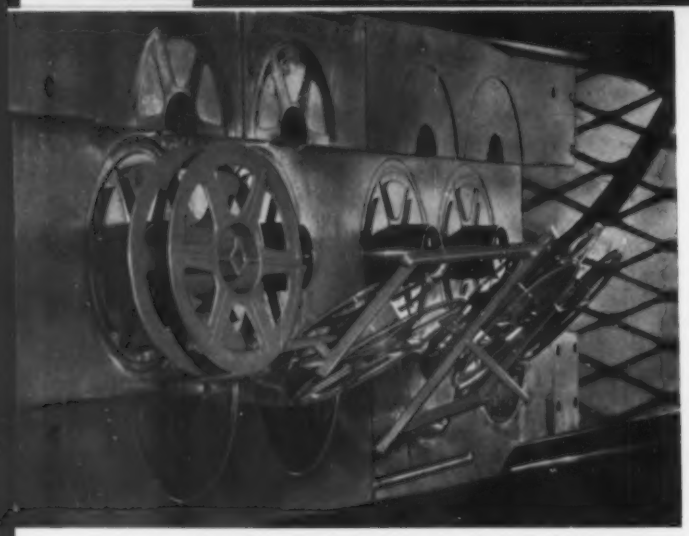
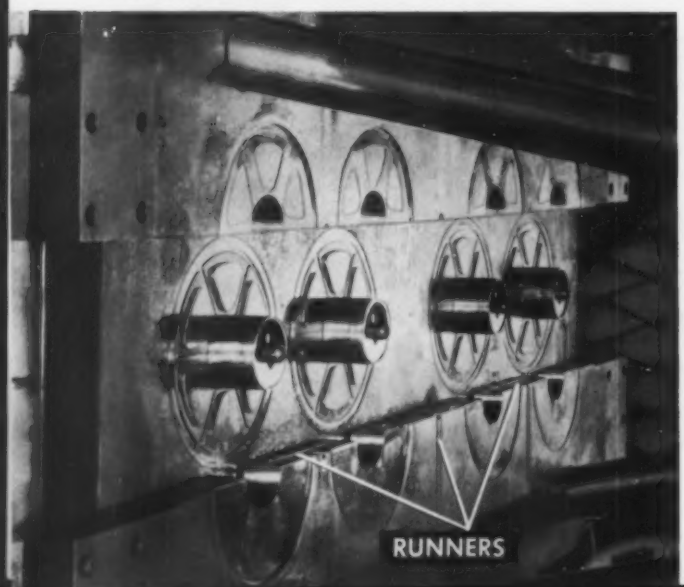


Fig. 1: Reels for 8-mm. movie film are ejected from automatic mold with vertical slide plates

Fig. 2: Slight burrs that are left at gate points are "rolled down" in specially adapted machine

Fig. 3: Mold for 8-mm. reels, just after ejection, showing distribution of runner segments on lower vertical slide plate. (Photos, Eastman Kodak)



Plant planned

For years the author's company made metal spools and reels for its photographic films. The metal spools required three forming operations, assembly of the three pieces, degreasing, and finishing. Today's plastic spools are made, completely finished and colored, in one injection molding operation. Plastic reels also survive rough handling better than their metal predecessors, look nicer, and run more quietly on the projector. Many of these parts are draftless, must meet very tight dimensional tolerances, and must be free of burrs.

To mold these "sundries" economically and reliably—they are keyed to film production and processing—required careful attention to mold design, utilization of labor, plant layout, and quality control procedures. The result is a years-ahead molding department, which has generously been opened for inspection to all molders who care to visit it. Here is the first published "tour" of a plant that is certain to provide much food for thought to experienced molders and those planning such facilities.—*Ed.*

Highest economy in injection molding is best realized through the use of automatic cycling. However, full consideration must first be given to the following questions:

1) Can the molds be designed for automatic operation?

2) Can molds and machines be protected from damage caused by faulty operation?

3) Can the workplace be set up for automatic molding conditions?

4) Can standard molding machines be used without special-purpose tooling?

5) Can molding materials be supplied on a continuous delivery schedule?

6) Is the quality-control system adaptable to automatic operation?

If the answers to these questions are all in the affirmative, a high degree of production flexibility and efficiency can be realized.

In the layout of the Sundries Injection Molding Dept. at Kodak Park, we aimed for maximum production flexibility and efficiency. Considerations which guided our layout were:

1) Plenty of room between machines to per-

*Adapted from a talk presented at the SPE Annual Technical Conference in Detroit, January, 1958.

†Project Engineer, Eastman Kodak Co., Rochester, N. Y.

for automatic molding*

By Lawrence A. Ulmschneider†

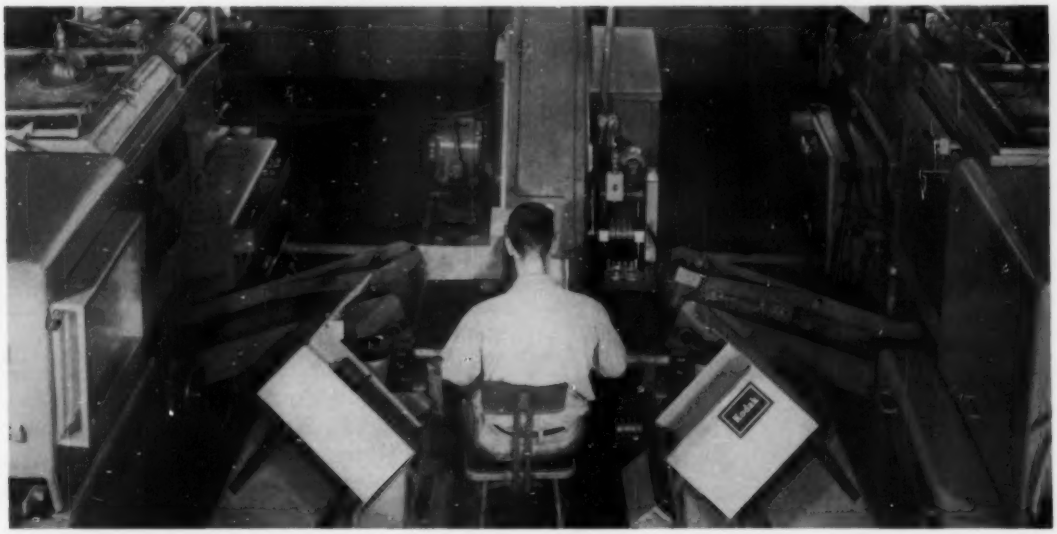


Fig. 4: Operator sits at focal point between two machines, inspects and packs 8-mm. reels. Tally of filled boxes gives number of finished reels produced

mit workplaces to be located adjacent to the machines.

2) Prompt and orderly removal of molded parts.

3) Runners automatically reduced and returned to the machines.

4) Easy accessibility to machines for maintenance, repair, and good housekeeping.

Practically all the molding operations in this plant are performed automatically.

Reel mold

One of the first molds which we designed for fully automatic operation was used to mold one-piece, 8-mm., lightweight projection reels for home movies. Fig. 1, p. 120, shows a complete shot consisting of four 8-mm. reels about to drop free of the mold. The view shows the point of runner control, where the runner is ripped from the nozzle, and distribution channels for plasticized material. Gates and runners are large; the impact of the molded element dropping to the collection pan is not enough to break the reels away from their runners, and this operation is done separately by hand. (Whenever part requirements allow, we design our molds to eliminate degating by hand after molding.) The gate stubs are rolled down while the plastic is still warm, as in Fig. 2, p. 120. Rolling the sharp edges prevents damage to the photographic film that is later wound on these reels.

Figure 3, p. 120, shows a mold in open position after the reels have been ejected. Vertically sliding plates are mounted on liner rods at the side of the mold, and the runner is distributed and carried out between the slide plates. The shot of plastic material is locked in between the plates, so the molded element is discharged as a single mass when the slide plates are opened. The molded mass is ejected from the mold by stripper sleeves, which are shown in discharge position in Fig. 3.

It is very important that the finished reels not be contaminated with oil. That is why side-mounted liner rods are used to carry the slide plates and are lubricated outside the molding area.

A clearance of from 3 to 4 mils is left between the slide plates and rear section of the mold to avoid rubbing action during opening and closing. This permits the slide plates to be

in contact only during direct closed pressure when the actual molding is being done.

Tooling factors

In tooling up for the one-piece lightweight projection reel, there were two mandatory requirements: they must be 100% inspected, and they must then be placed in fiber containers (see Fig. 4, p. 121).

With the above requirements in mind, belt conveyors from two adjacent molding machines are located to carry molded elements to a workplace which is centrally situated between the two machines. Within easy reach of the operator-packer-inspector (OPI man), two wooden benches are placed to hold the fiber containers, in which he packs the molded reels. Another belt conveyor is placed in front of the man to carry away separated runners to a grinder that breaks them up and returns them to the molding machines. The degater is placed adjacent to the belt conveyor leading to the grinder. The OPI man is also responsible for tallying the finished reels.

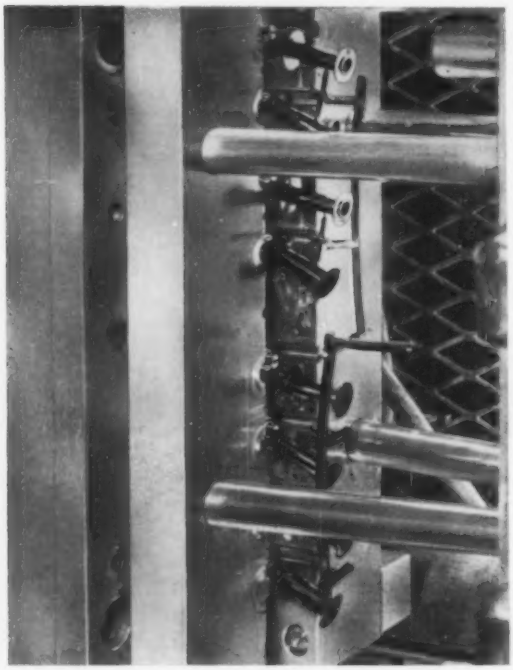


Fig. 5: Small spools for 35-mm. still cameras are ejected from mold with horizontally moving slide plates. Here runners are in front faces of slide plates

Mold for 35-mm. spools

Film spools for 35-mm. still cameras are molded in an eight-cavity mold shown discharging in Fig. 5, left. This mold is much like the lightweight projection-reel mold, the major difference being that this mold is designed to operate in a vertical plane, rather than horizontally. The slide plates are much more massive in proportion because the loading is in a tangential direction. The stripper sleeves which are shown in full ejection position in Fig. 5 operate in unison to strip the whole molded element as a mass from the mold.

The gating area in this mold has been kept small to encourge the spools to break away from their runners by force of impact when the whole molded mass drops out of the mold into the machine collection pan. Each cavity is

Fig. 6: Spools for 35-mm. still camera film are molded automatically on these three machines. Note clean, functional arrangement of conveyors, machines, and nested tote boxes. Single operator receives, inspects, and weighs into tote boxes entire output of all three machines

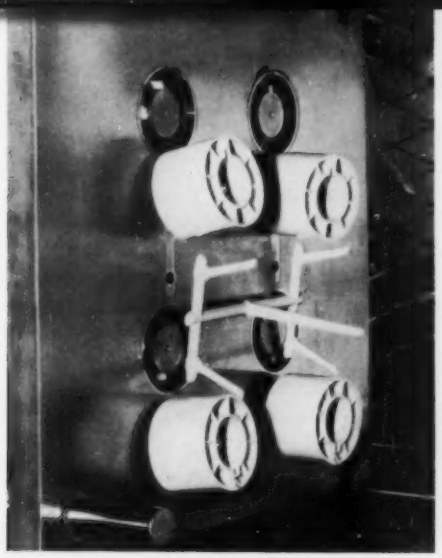


Fig. 7: Pieces being ejected from tunnel-gated mold are cores for 35-mm. movie film reels. Cores, with intricate ribbed structure, are held to extremely tight dimensional tolerances

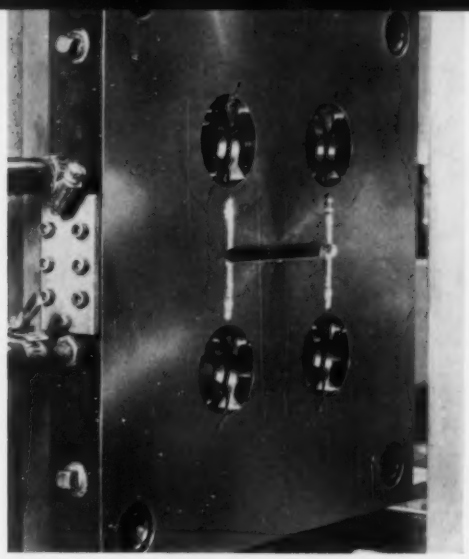


Fig. 8: Back plate of core mold, showing intricate fingers around which ribbed cores are molded. None of in-going surfaces of cavities have any draft, yet they eject with almost perfect reliability

filled through a gate only 18 mils in diameter. Clean spool breakaways eliminate the need for gate cleaning.

Tooling for the 35-mm. spool

As in the previous set-up for the one-piece projection reel, product characteristics and requirements were carefully analyzed when developing the tooling for the production of 35-mm. film spools. In this case, there is no need for the spools to be packed in fiber containers. However, the spools must be inspected, machine output monitored, and the runners have to be returned to the machine after regranulation.

Figure 6, p. 122, illustrates the set-up which was designed for the production of the film spools on three injection machines "tied together" as a production group. Two of the machines are positioned adjacent to a centrally located man—in this case we call him an operator-weigher-inspector (OWI man). Still another machine is placed adjacent to the one at the OWI man's left. A belt conveyor joins the machines by carrying molded elements from the far machine (#4 in Fig. 6) to #5 machine, and another belt conveyor moves the molded elements to a work table. Another belt conveyor carries the molded elements from #6 machine to the work table.

The OWI man takes molded elements as they reach the work table and sorts the spools from their runners. He scrapes the spools through an opening in the table, and they

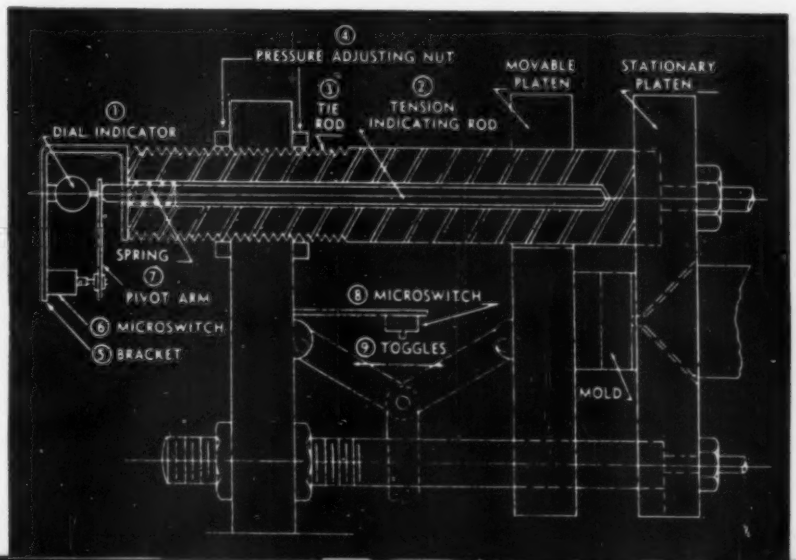


Fig. 9: Sketch showing details of tension-indicating device that protects molds against closing on hung-up pieces and being damaged

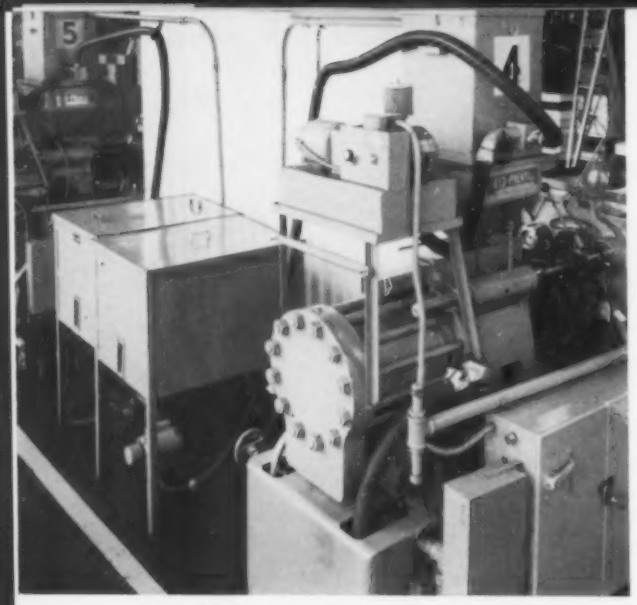


Fig. 10: Virgin and reground pellets are pneumatically conveyed through flexible hose to hopper-dryer of automatic molding machine

Fig. 11: Inspector checks sample reels from production lot for parallelism of their flanges. If there are indications that lot is defective, it is set aside and every part is inspected

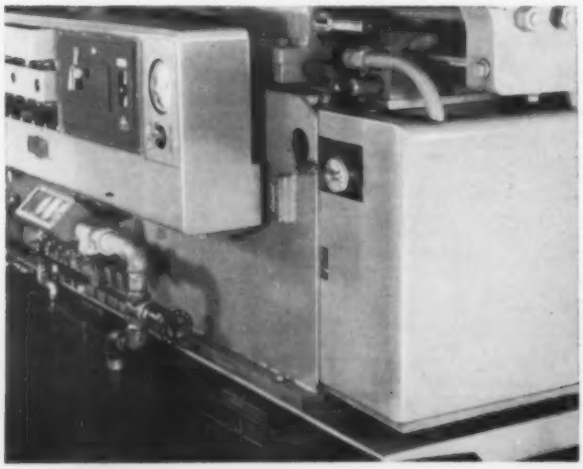


Fig. 12: Good housekeeping of injection machines at Kodak Park is promoted by shallow basins that catch oil drippings and stray molding pellets. Oil and dirt are removed with vacuum cleaner once each shift

roll down an inclined chute into a weighing tray. The runners are placed on a belt conveyor in front of the OWI man, where they are moved to a regranulator.

Weighing trays are designed for pivotal dumping when their content's weight is sufficient to move a beam scale arm. The weighing trays are dumped into standard metal tote trays which nest within one another sufficiently to insure easy stacking, but leave enough cubic area between to carry a reasonable load of spools. The weighing is accurate enough to insure that no tote trays will be filled to a point that would allow the tray on top of it to crush or otherwise damage the spools in the tray. The weigh method is also useful to determine total machine output for production-record purposes.

In practice, the OWI man dumps the weighing trays whenever they tip the beam scale. As can be seen from Fig. 6, he gets empty tote trays from stacks along the aisle, places the trays under the scales to receive molded spools, and stacks filled tote trays along the aisle for pick-up by handlers. Filled trays are carried away and empty trays brought to the workplace aisle station by fork lift trucks on a schedule which insures a constant flow of spools from the three injection molding machines.

Examination of the various workplaces, such as those illustrated by Figs. 4 and 6, shows the exceptional flexibility of tooling in these areas. Conveyors, regranulators, work tables and chairs, tote trays, and containers can be moved at will and a different work set-up installed within a very short time. Actually, the only permanent parts of the set-ups are the standard injection molding machines themselves.

Mold for 35-mm. movie-film cores

A four-cavity, tunnel-gated mold for 35-mm. motion-picture-film cores is shown separating in Fig. 7, p. 123. The sprue and runners are ejected somewhat in advance of the stripping of the cores. A group of ball-ended pins first enters guide holes to push away the sprue and runners while the parts are still gripped between the spokes of the core. After the sprue and runners are stripped from (*To page* 229)

Back and front of slender new TV set are equally attractive. Picture tube mask and back are molded of styrene. Cabinet is made of vinyl-aluminum laminate. (Photos, Philco)

Beautiful backs

Portable TV sets are being made more attractive by redesigning the backs—in plastics

With the advent of portable TV, the back of the set has become an important style element. A portable does not remain in one spot with its back to the wall. Instead, it is moved about so that all of its sides are generally exposed to view.

In the light of this, TV manufacturers are now taking another look at the rear of their cabinets. Philco Corp. and Motorola, Inc., for example, have designed their latest-model portables to include highly decorative backs—and have turned to plastics materials to do the job.

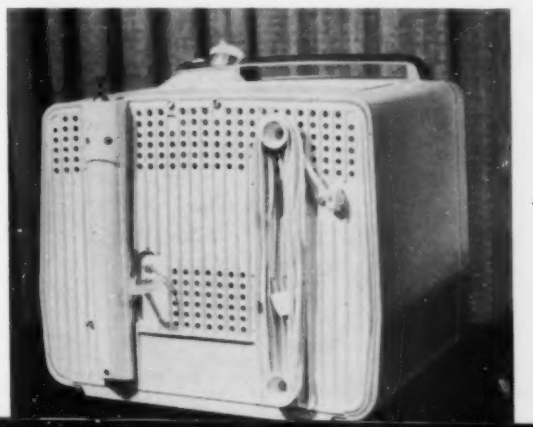
Although different resin formulations and different methods of processing are used in producing the new backs, the end result is the same in each case: a television set that is attractive in appearance, no matter from which angle it is viewed.

In advertising its new Seventeener line of portable TV sets, Philco calls attention to its new design approach with the headline, "Even the back is beautiful!" The company's styling objective was a cabinet that looked as slender as possible. A three-piece cabinet was adopted, consisting of a vinyl-clad aluminum body with injection molded styrene front and back. The body section is dark, and the plastic moldings are light, so that the overall depth appears to be just the center portion, with the light components in the background.

The backs of Motorola's new TV portables consist of a thermoformed impact styrene sheet bonded to a fabricated hardboard backing. After forming, the styrene back is pierced to provide holes for cabinet ventillation and trimmed. It comes in a variety of colors to match the cabinet finish.

Credits: Back of Philco set molded of Koppers P-2121 A styrene; picture tube mask of Dow Styron 480 high-impact styrene. Both parts molded by Buffalo Molded Plastics, Inc., 3230 Union Rd., Buffalo, N. Y. Back of Motorola set thermoformed of Dow Styron 440 sheet by Cortland Industries, Inc., 4545 W. Cortland, Chicago, Ill.

Thermoformed styrene TV back is pierced, after forming, for ventilation. At left is molded styrene antenna housing. (Photo, Motorola)



Attractive table setting with dinnerware injection molded of styrene-acrylonitrile copolymer. Tableware retails in medium price range. (Photos, The Dow Chemical Co.)

New copolymer dinnerware

Injection molded styrene-acrylonitrile

brings quality to thermoplastic tableware field

A new type of high-quality thermoplastic dinnerware is now being made by three injection molders on a proprietary basis in their own individual patterns. Reported to offer a combination of light weight, exceptional durability, resistance to staining, and the ability to be washed in automatic dishwashers without risk of distortion, the sets are molded of Tyril, a new styrene-acrylonitrile copolymer developed by The Dow Chemical Co.

Market debut of the new dinnerware sets offered by Gitsware Corp., Chicago, and The Ohio Art Co., Bryan, Ohio, was preceded by an extensive testing program. Trump Plastics, Inc., Cuyahoga Falls, Ohio, was actually first to market Tyril dinnerware over a year ago, and has also used the material for molding transparent heavy-duty tumblers, which are guaranteed against breakage in general use.

Because the new copolymer is a thermoplastic and can be injection molded, producers are now able to offer quality dinnerware in a medium price range. Starter sets (16 pieces) will retail at $9 to $15. Dow has created a special symbol to identify dinnerware molded of Tyril and will authorize its use only by molders who adhere to specific standards and manufacturing techniques.

Standards set

These standards include ability to withstand immersion for 10 min. in a 195° F. water bath; molded parts free of warpage, lamination, sink marks, contamination, blemishes, and flashed parting lines; and satisfactory design and section thicknesses.

Major properties reported for dinnerware made of the new styrene-acrylonitrile include high resistance to breakage, staining, and retention of food odors. Although an expansion of the $70 million plastics dinnerware field is expected to constitute an important market outlet for Tyril, the material is also proposed for use in cutlery handles, appliance housings, aerosol nozzles, rigid food containers, closures, pen and pencil barrels, fan blades, furniture

legs, extruded bristles and shapes, and similar items.

One of the most significant ways in which Tyril differs from general-purpose polystyrene is its higher critical stress. The stress required to cause cracking or crazing of the new plastic in air is three times that of styrene; therefore, higher internal and external loads are possible before stress cracking takes place.

How material was tested

Laboratory evaluation of the resistance of Tyril dinnerware to chipping and breakage involved a series of impact tests of the drop missile type, using a sphere 1½ in. in diameter dropped from a 4-ft. height. The missile was weighted progressively heavier with each drop until failure of the piece occurred.

Resistance to staining was evaluated by accelerated tests involving direct contact with more than 30 foodstuffs, including peanut butter, French dressing, honey, mustard, syrup, and chocolate milk. Molded strips of Tyril, placed in glass jars containing the different types of foods, were withdrawn periodically for examination. These tests are also reported to have demonstrated the excellent resistance of Tyril to the retention of food odors.

Safe in automatic dishwashers

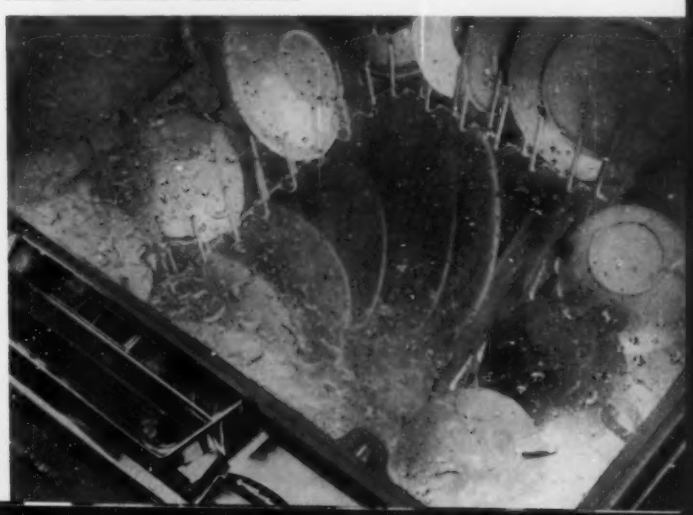
With dinnerware molded of conventional styrene, washing of the pieces in automatic dishwashers has presented a problem due to the danger of heat distortion. However, according to Dow and the molders, Tyril dinnerware can be washed in any standard automatic dishwasher under normal operating conditions—*i.e.*, inlet water temperatures ranging between 140 and 160° F. and drying temperatures up to 190° F.—without risk of heat distortion. The safety factor provided by the material is indicated by the fact that Dow's qualification test for molders includes 10 min. in a 195° F. water bath, as indicated above. The practical heat distortion of Tyril is between 215 and 225° F.; that for regular styrene around 175° F.

In automatic dishwasher tests, Dow found that some dishwashers reached a temperature as high as 175° F. during parts of the cycle, but that most maximums ranged from 120 to 150° F. These figures are in line with results recently published by Consumers' (*To page* 232)

Impact test of copolymer dinnerware. Progressively heavier spheres of 1½-in. diameter are dropped on specimen until failure occurs

Chips of styrene-acrylonitrile are immersed in jars of representative foodstuffs to test the material's resistance to food staining

Styrene-acrylonitrile dinnerware is reported to have withstood repeated cycling in standard automatic dishwashers



PLASTICS PRODUCTS

Bait bucket aerator

The "Aqua-Life" bait bucket aerator will keep minnows, shrimp, or other live bait fresh and kicking for hours. Powered by a 6-v. battery, the device has a molded butyrate case which houses a miniature piston pump that forces a steady supply of air through a length of vinyl tubing into any bait container.

The butyrate housing resists rough handling and exposure to changing weather conditions. Suggested retail price is $10.95.

Credits: Manufactured by Design Products, Inc., 1177 Central Avenue, Sarasota, Fla.; case molded by Florida Plastics, Inc., 420 Tenth Ave., Palmetto, Fla., of butyrate supplied by Eastman Chemical Products, Inc.

Rust-proof tackle box

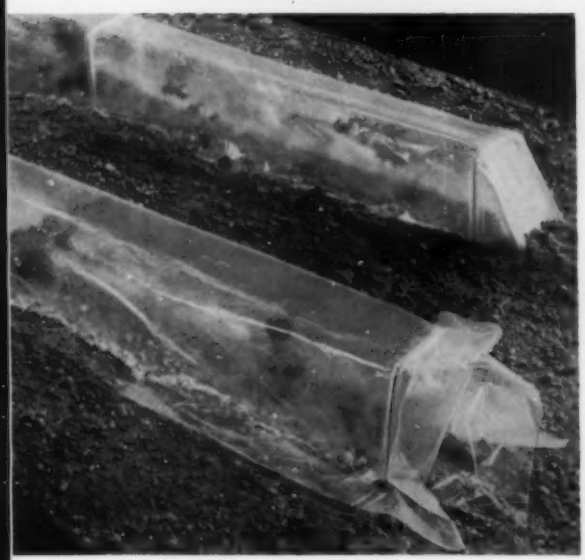
Several features long sought after by fishermen have been incorporated in a new line of molded polystyrene tackle boxes. Produced of super high impact material, the boxes have tongue-and-groove joint between lid and body which increases buoyancy if the closed box is accidentally dropped into the water. Since they are corrosion-proof, the boxes are suitable for both salt and fresh water fishing. The styrene trays, lined with cork, will not scratch or cause metallic lures to rust. For ease of cleaning, the boxes have rounded corners. Four models are available, retailing from $3.00 to $9.95; the $9.95 model is pictured.

Credits: Manufactured by Plano Molding Co., Plano, Ill., from Styron 480 supplied by The Dow Chemical Co.

Film cold frame

A late frost, the big hazard of spring planting, is no threat to the home gardener who uses Sav-a-ro, an outdoor "greenhouse" made up of a double layer of polyethylene film 12 ft. long. The film is held in shape by pre-bent metal wickets which the gardener inserts through channels between the film layers. By covering the bottom edges of the film "greenhouse" with soil, a complete seal is provided against the elements.

Credits: Manufactured by Crystal-X Corp., Lenni Mills, Pa., of polyethylene supplied by Du Pont.



Coffee mug

A hefty new polyethylene coffee mug will hold a full 8 oz. of liquid. Molded of medium density material, the mug is completely boilable and unbreakable, as well as stain resistant. Exterior molded-in flanges make it possible to nest cups safely in tall stacks.

The mugs are injection molded in a two-cavity mold; each double shot weighs 4¼ ounces. The molding cycle is adjusted to permit full cure of the thick section of the material. The mugs, which will resist temperatures above the boiling point, are produced in red, yellow, pink, and turquoise.

Credits: Molded by General Molded Plastics, Inc., 5151 Sharp St., Dallas, Texas, of medium density polyethylene from Spencer Chemical Co., Kansas City, Mo.

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Plastics Engineering

Dr. James F. Carley, Engineering Editor

Dustless PVC eases processing

By Robert S. Holdsworth,† W. Mayo Smith,† and John T. Barry†

A new family of suspension-polymerized polyvinyl chloride resins is characterized by unusually large and uniform spherical particles (diam. = 0.2 to 0.6 mm.) and by its freedom from dust. Plasticizer absorption and flow properties of dry blends are excellent, as is general processibility. Electrical, physical, and visual properties are at least as good as those of established resins. To make dry blends, the new polymers should be mixed with plasticizer while cold, *then* warmed, reversing the traditional procedure. Four grades in different molecular-weight classes make possible a balance between certain physical and processing characteristics. These resins are processed in conventional equipment.

A newly developed process for the polymerization of vinyl chloride yields large, uniform polymer particles that are completely free of dust. The appearance of these particles suggested the name PVC Pearls.[1] Four grades are commercially available: Types 2250, 2225, 2200 and 2185, representing high, medium, low, and very low molecular weight respectively.

Vinyl chloride is usually polymerized as either an emulsion or a suspension in water. In emulsion polymerization, relatively large amounts of surface-active agents and catalysts are used. The resulting emulsion is then spray-dried or flocculated and very fine polymer particles are obtained. Most of the polymerization additives remain occluded to the polymer. The presence of these residual catalyst fragments and surfactants in the finished polymer is not always deleterious. However, in applications which require superior color, clarity, heat resistance, and electrical properties these added materials cannot be tolerated.

Most suspension polymerization formulations yield resins which contain minimum amounts of additives. In this process the amount of surface-active agents is very low, and the resulting polymeric product is obtained as a suspension which is separated from the water by filtration or centrifugation. Suspension polymer usually has a broad particle size distribution, ranging from dust-like particles of only a few microns to large particles of several hundred microns. However, since there is little extraneous matter present, the color, clarity, heat resistance, and electrical properties are good.

In the production of polyvinyl chloride (PVC) by the suspension process, an attempt is frequently made to produce a small particle size because this usually gives the best processing and physical properties. However, this

*Reg. U. S. Pat. Off.

The original version of this article was presented at the 14th Antec of the Society of Plastics Engineers, Detroit, Jan. 1958.

†Escambia Chemical Corp., Research Center, Wilton, Conn.

[1]PVC Pearls is a trademark of Escambia Chemical Corp.

Fig. 1: Photomicrographs (40X) of PVC Pearls (left) and commercial PVC resin (right) before compounding. Differences in shape and size distribution probably account for good processibility of Pearls

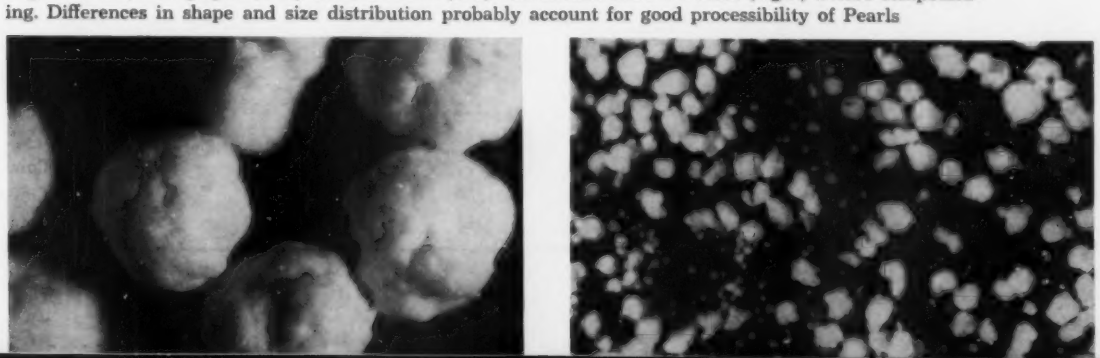


Table I: Particle size: PVC Pearls and conventional vinyl resins

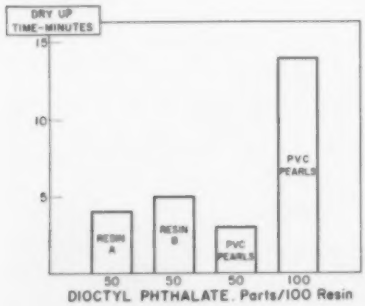
Screen analysis % retained on	*PVC Pearls Type 2250*	*Resin A*	*Resin B*
20 mesh screen	0	0	0
40 mesh screen	21	0	1
80 mesh screen	79	26	3
100 mesh screen	0	54	20
140 mesh screen	0	17	47
200 mesh screen	0	3	20
Through 200 mesh	0	0	9
Bulk density, lb./cu. ft.	30.2	30.6	33.2
Relative viscosity (1% in cyclohexanone @ 25° C.)	2.45	2.37	2.44

small particle size causes objectionable dusting during handling and results in weight losses.

PVC Pearls are made by a radically different suspension polymerization that yields large particles. Partly because of this, the Pearls have been found to process more easily than the other suspension resins. The physical properties of finished Pearl compounds are equal or superior to those of conventional resins. Dusting is eliminated while bulk density remains virtually the same as that of conventional resins. Screen analyses of a PVC Pearl polymer and two widely accepted commercial PVC resins which were probably prepared by suspension are given in Table I, above.

The Pearl particles appear to the eye to be smooth, uniform spheres, but photomicrographs (Fig. 1, p. 131) show that the PVC Pearls actually have a rough, pitted surface. Thus, one would expect the effective surface area to be large, because of the microscopic irregularity of the particles. This expectation is confirmed by absorption studies.

Fig. 2: Time required to make dry blends from different PVC resins. A and B could not take up 100 parts of DOP without getting sticky



Plasticizer absorption

A great deal of the PVC resin produced is used in applications which require a flexible material. This flexibility is achieved by the incorporation of suitable plasticizers. The resin and plasticizer may be pre-blended at room temperature and the mixture warmed to a point below the fusion temperature of the resin to speed distribution of the plasticizer into the resin particles. The result is a blend that feels dry to the touch.

An acceptable PVC resin should absorb the required amount of plasticizer and should yield a dry blend on warming. The blend should be dry enough to flow through lines or be blown through a conveying system without caking or otherwise interfering with processing.

The heating time required to produce resin-plasticizer dry blends and the flow properties of these blends were studied. The resin and plasticizer were blended in a Hobart Mixer (model N-50). A steam jacket was built onto the bowl of this mixer and the temperature of the bowl was held at 100° C. during the test. The mixer speed was 140 r.p.m. The dry-blend time is defined as the time required to produce a dry resin-plasticizer mixture while the bowl is held at this temperature.

A comparison of the dry-blend times of the PVC Pearl polymer with two commercial resins reported to have outstanding dry-blend qualities was made and is shown in Table II, below, and Fig. 2, left. The PVC Pearl resin is

Table II: Absorption of dioctyl phthalate plasticizer by PVC resins

Resin	*Parts DOP per hundred resin*	*Dry-up time*	*Dry blend flow rate*
		min.	*g./sec.*
PVC Pearls	Unplasticized		9.1
PVC Pearls	30	0	8.4
PVC Pearls	50	3	6.2
PVC Pearls	70	5	4.5
PVC Pearls	90	11	4.4
PVC Pearls	100	14	4.0
PVC Pearls	120	85	3.8
PVC Pearls	150	180	3.4
A	Unplasticized		7.7
A	30	1	6.7
A	50	4	3.2
A	70	5	2.9
A	90	15	2.3
A	100	>100	Will not flow
B	Unplasticized		5.0
B	30	5	Will not flow
B	50	5	Will not flow
B	100	>100	Will not flow

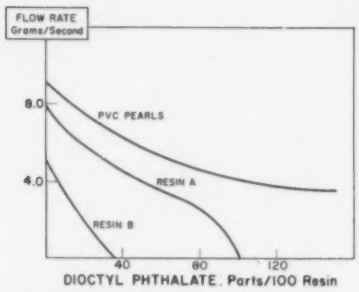


Fig. 3: Flow of resin particles through test funnel drops off as dioctyl phthalate (DOP) content rises

about equivalent to the best commercial resins in its ability to quickly absorb 50 parts of dioctyl phthalate (DOP) per 100 parts of polymer. However, only the Pearl polymer would absorb 100 parts of DOP and yield a dry blend in this test. The Pearls are, therefore, strongly recommended where high plasticizer levels are used.

For maximum processing economy, a resin should not only have good plasticizer absorption but the resulting dry blends must flow readily. The flow times of resin-plasticizer blends through a 60° stainless steel funnel having a ½-in. opening were measured. In Fig. 3, above, these flow rates of DOP-Pearl dry blends are shown to be high, even at extremely high plasticizer levels. One of the conventional resins is seen to flow fairly well at moderate DOP levels, but the other did not flow at all, even at the low DOP level. Only the Pearl polymer produces dry blends with high, consistent flow rates over a wide range of DOP content.

Polymeric plasticizers are frequently used in PVC compounding. Pearl resins are particularly recommended for applications in which appreciable quantities of these polymeric plasticizers are required. As shown in Table III, below, the polymer will absorb up to 100 parts of Paraplex G-50, a commercial polyester plasticizer with a molecular weight of 2200. These data also show that the flow of the dry blend made from this polymeric plasticizer and the Pearl resin was superior to that of the blend made with conventional resin. The Pearl polymer imparts excellent flow even when 80 parts of this polyester plasticizer are used. Dry blends with conventional resins fail to flow at these plasticizer levels.

It is interesting to note that dry blends made with PVC Pearls and the polyester plasticizer flow better at low plasticizer levels than those made with DOP. However, considerably more DOP than Paraplex G-50 can be absorbed without complete loss of particle flowability.

The large uniform particle size is probably responsible for these excellent flow properties of the Pearls, since there is no fine ma-

(*To page* 136)

Table III: Absorption of polyester plasticizer by PVC resins

Resin	*Parts Paraplex G-50 per hundred resin*	*Dry-up time*	*Dry blend flow rate*
		min.	*g./sec.*
PVC Pearls	Unplasticized		9.1
PVC Pearls	30	1	10.0
PVC Pearls	50	5	10.0
PVC Pearls	70	40	10.0
PVC Pearls	100	60	Will not flow
A	Unplasticized		7.7
A	30	1	7.7
A	50	6	7.7
A	70	>60	Will not flow

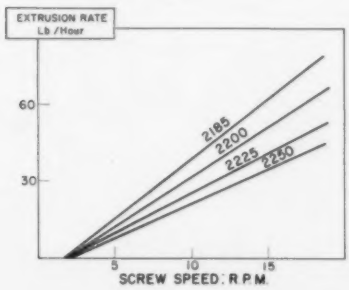
Table IV: Extrusion of PVC Pearls

Pearl resin	*2250*	*2225*	*2200*	*2185*
Relative viscosity (1% in cyclohexanone @ 25° C.)	2.45	2.25	2.03	1.85
Specific viscosity ASTM D 1243-54	0.42	0.37	0.31	0.27
Extrusion rates, p.p.h.				
Screw speed = 8 r.p.m.	16	20	24	34
Screw speed = 11 r.p.m.	24	27	38	46
Screw speed = 14 r.p.m.	31	38	48	58
Screw speed = 16 r.p.m.	39	44	52	68
Screw speed = 18 r.p.m.	44	51	65	78

Extruder temperatures, °F.	
Zone 1	260
Zone 2	320
Zone 3	390
Zone 4	410
Gate	385
Head	420
Die	385

Compound	
Pearl resin	100.0
Dioctyl phthalate	45.0
Epoxy plasticizer	5.0
Cadmium stabilizer	3.0
Stearic acid	0.5

Fig. 4: In extrusion of flat strip from plasticized PVC Pearls, output falls as molecular weight rises



A few of the Stokes Model 741's that run round the clock at Pass & Seymour, Inc. These machines are equipped with La Rose pre-heaters to automatically feed pre-heated molding powder

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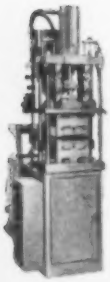
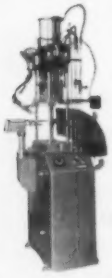


The Stokes Model 800 automatic . . . 15 and 25 ton models. Has all the advanced features of the larger Model 741's.



The Stokes Model 725 automatic . . . 25-ton capacity. A simple low cost machine for varying production runs.

The Stokes Model 726 semi-automatic compression molding press. 50, 100, 200 and 300 ton models.

The Stokes Model 727 semi-automatic transfer molding press. 50, 100, 200 and 300 ton models.

Some of the many parts produced on Stokes automatic molding presses at Pass & Seymour, Inc.

40-million parts per year from Stokes automatic presses at Pass & Seymour, Inc.

This manufacturer of wiring devices now has 42 Stokes automatic compression molding presses in operation in their Syracuse plant. Most of these operate on an around-the-clock schedule.

Pass & Seymour, Inc., produce hundreds of different plastic bodies and fittings for household and industrial wiring devices—such as switches, convenience outlets, sockets and wall plates. Completely dependable operation with minimum down time has been absolutely essential to this high volume producer. Field interchangeability of Pass & Seymour parts necessitates dependable molding accuracy.

According to Mr. D. C. Amsler, Factory Manager —"We believe that these presses represent the most economical means of producing our parts. This stems from the fact that these presses are automatic, require a minimum of maintenance and a minimum of skilled help. Due to the fact that they are fully automatic, they can be operated around the clock. Therefore, the required production volume can be obtained with a minimum mold expense as compared to large multi-cavity compression molds or transfer molds. We are well satisfied with the performance . . .".

For your own molding operations, it will pay you to check the advanced features of the Stokes 741's that bring you fully automatic compression molding in its most fool-proof, most productive form.

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Press capacities of 50, 75, 125, and 200 tons are available. Write today for a copy of our new bulletin on the Model 741—for a consultation on your requirements—or for a cost study on your own specific applications.

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Table V: Physical properties of PVC Pearls

Type	*2250*	*2225*	*2200*	*2185*
Relative viscosity (1% in cyclohexanone @ 25° C.)	2.45	2.25	2.03	1.85
Specific viscosity ASTM D 1243-54	0.42	0.37	0.31	0.27
Tensile, p.s.i.	2900	2850	2650	2400
100% modulus, p.s.i.	2000	2000	1900	1850
Elongation, %	315	290	280	250
Hardness, shore A	89	90	87	86
Tabor abrasion loss 2000 cycles, g.	0.130	0.145	0.150	0.170
Heat resistance min. to black @ 190° C.	90	75	60	45

Compound	
Resin	100.0
Dioctyl phthalate	42.5
Barium-cadmium stabilizer	2.5
Epoxy stabilizer	1.0
Stearic acid	0.5

terial to pack between the large particles and especially since there is less contact surface between particles.

Extrusion of dry blends

PVC Pearl compounds may be extruded with standard plastics extruders, without prior milling or intensive mixing.

It is well known that variations of the blending and extrusion conditions can strongly influence the quality of PVC products. A few of the most important considerations are described in the material below.

As already noted, the Pearls absorb plasticizer readily, and if proper precautions are not taken when small to moderate amounts of plasticizer are used, uneven distribution may result. Dry blends prepared with conventional PVC resins are frequently made by heating the resin and plasticizer before mixing. With the Pearl polymers, this technique tends to overplasticize the particles which are wet first and leave the remaining Pearl particles with practically little or no plasticizer.

Studies in a 1.8-cu.-ft. ribbon blender have shown that more uniform plasticizer distribution is obtained by first mixing the Pearls and plasticizers at room temperature, and then by warming them sufficiently to obtain a dry blend.

Dry blends prepared by both of these techniques were extruded. The dry blend prepared by mixing preheated materials yielded a strip containing hard, unplasticized particles, while the cold-mixed, post-heated dry blend yielded a strip free of these imperfections. In later studies it was found that Pearl dry blends extrude best under conditions which resemble those used for the extrusion of granulated compounds rather than conditions usually required for fine-powder dry blends. Extrusion rates up to 25% above those for normal dry blends have been obtained in production runs with the proper extruder conditions.

Table IV, p. 133, lists the conditions of some extrusion-rate experiments, results of which are shown in Fig. 4, p. 133. The dry blends were extruded as strips 1¼ in. wide by 1/16 in. thick from a 2.5-in. NRM extruder having a L/D of 20. Grades 2250, 2225, 2200, and 2185 were run. The plots of extrusion rate versus screw speed are best represented by straight lines for these resins and conditions. There was a significant drop in output as molecular weight rose. The resin having the highest molecular weight gave the slowest extrusion rate at a given screw speed. The color and clarity of the extruded tapes were good.

Calendering

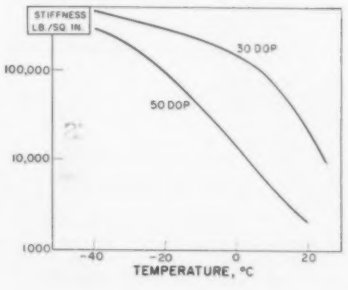
PVC Pearl polymers were compounded in an internal mixer and calendered into film using a four-roll, inverted-L, 8- by 16-in. calender. This film was free of gel particles or "fisheyes" and again exhibited unusually good color and clarity. It was readily heat sealed with standard radio-frequency heat-sealing equipment, giving seals that were stronger than the film.

Physical properties

Pearl polymers of the four different molecular weights listed in the first paragraph of this article were compounded with 42.5 parts of DOP and stabilized with a barium-cadmium-epoxy system. The physical properties of these compounds are shown in Table V, above. As expected, the high-molecular-weight resin had the maximum tensile properties, abrasion resistance, and heat resistance. These properties fell off as the molecular weight of the resin was reduced. In choosing a resin for a given use, one must remember that while better physical properties are obtained at high molecular weights, the lower-molecular-weight resins have better processing characteristics. The availability of four molecular-weight grades enables the user to select the resin offering best balance of physical properties and processing economics.

Torsional stiffness of these compounds was measured over a

Fig. 5: Molecular weight had no effect on stiffness-vs.-temperature characteristic of Pearl resins, though DOP content was important



Four parts of **TENITE BUTYRATE** form this tough, lightweight nozzle

Here's a good example of how a switch to Butyrate plastic can mean an improved product, with savings in both material and manufacturing costs.

Four parts of transparent green Tenite Butyrate make up this product. Assembled in an adjustable, leakproof fit, they form an attractive and durable hose nozzle which sells at a popular price.

These four plastic parts, including the threads, were injection molded in one quick operation. The "manufacturing" process consisted only of molding and assembly. By avoiding use of metallic parts, there was no casting, no forging, and no machining, even for the threads.

And look how well Tenite Butyrate meets the performance needs: It is a tough plastic, virtually shatterproof and ready to take a good measure of abuse; yet, it's light in weight. It resists corrosion and endures outdoor exposure over broad variations in temperature and humidity. Color is an integral part of the product and will not chip off or wear away. Tests show the assembled nozzle has withstood water pressures up to 500 psi.

Remember this use of Butyrate whenever you need a tough, outdoor plastic, readily adaptable to design. Tenite Butyrate is available in a wide range of flows and colors for injection molding or continuous extrusion. Look into the design and economy possibilities offered by this versatile plastic. For more information on Tenite Butyrate or any other Eastman plastic, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

Trans-Flo hose nozzle molded of Tenite Butyrate by The Vichek Tool Company, Cleveland 4, Ohio.

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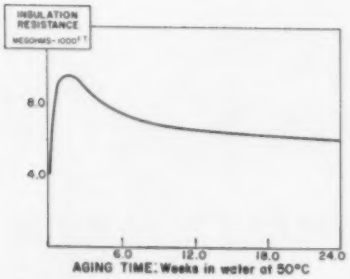

Fig. 6: After about six weeks, insulation resistance of Pearl resin wire-covering seems to stabilize at about 65 times U/L minimum requirements

Table VI: PVC electrical insulation

PVC Pearls	100.0
DOP, electrical grade	52.0
Basic lead carbonate	10.0
Clay, pigment 33	7.0
Lead stearate	0.5
Compound extruded on #14 copper wire	
Insulation resistance = 6.5 megohms —1000 ft.	
Aged 24 weeks in water @ 50° C.	

range of temperature, using the test developed by Clash and Berg (ASTM D 1043-51), with the results shown in Fig. 5, p. 136. Each resin was run at two plasticizer levels—30 and 50 parts of DOP. At each level of plasticizer content, a single curve represented the behavior of all four resins.

Thus, while the plasticizer level has a significant effect, the molecular weight of the resin, in the range that is reported here, does not materially affect the torsional stiffness.

Electrical insulation resistance

PVC resin is widely used as electrical insulation on wire. Good electrical insulation properties, wide color range, ease of production, and low cost are several of the factors which make vinyls attractive.

The suitability of a given PVC resin for electrical applications is best determined by preparing a compound and actually using it to insulate wire. The insulation resistance is measured while the wire is immersed in water. It is desirable to test over an extended period of time to account for such factors as aging, shrinkage, leaching out of plasticizer, and water absorption.

The high molecular-weight Pearl polymer was compounded in an electrical stock as shown in Table VI, left, and this compound was extruded on #14 copper wire at about 300 ft./min. in a thickness of 1/32 inch.

The wire was immersed in water at 50° C., and the insulation resistance was measured over a period of 24 weeks. The results of this test are shown in Fig. 6, left. The insulation resistance of Pearl compound levels off after about six weeks, indicating that the compound has good aging qualities. The equilibrium insulation resistance of 6.5 megohm-kilo-feet is considerably above the Underwriters' Laboratories requirements of 0.1 megohm-kilo-feet.

The Pearl resin was evaluated by a large insulated wire manufacturer. Aging studies showed that the insulation compound retained 94% of its original elongation after aging seven days at 113° C., while the retention of elongation of a good electrical grade commercial polyvinyl chloride resin was only 88% in the same test.

The acceptable insulating properties of compounds based on the Pearl polymer, together with the ease of extrusion directly from dry blends, suggest the use of this resin for electrical applications, especially for jacketing outdoor wiring and for building wire.

Rigid compounds

The PVC Pearl polymers are particularly well suited for rigid applications. A low-molecular-weight polymer is usually preferred, since little or no plasticizer can be used and optimum processing properties are required. The low-molecular-weight polymer, Type 2200, was stabilized with 3% of dibutyl tin mercaptide and milled on a 16-in., differential-speed mill at 177° C. stock temperature. The compound was found to band quickly and a smooth, rolling bank was obtained. The heat stability of the compound was outstanding as compared to that of commercial polymers (see Table VII, below). The physical properties were determined and all the resins studied were found to be equivalent to those of competitive resins of similar molecular weights.

The low-molecular-weight PVC Pearls are recommended for rigid applications in which normal heat distortion temperature and impact strength are required with low-temperature processing, good color, clarity, and heat resistance.

Acknowledgments

The authors are indebted to many of their fellow workers who helped produce the information here: A. Di Nardo, J. F. Gabbett, V. R. Pallas, J. R. Grant, N. T. Flathers, R. E. Johnson.—END

Table VII: Properties of PVC rigid compounds

	PVC Pearls Type 2200	*Resin C*	*Resin D*
Relative viscosity (1% in cyclohexanone @ 25° C.)	2.03	2.14	1.84
Milled @ 177° C. time to discolor, min.	90	40	30
Heat distortion temperature, °C. fiber stress of 66 p.s.i.	80	80	—
Heat distortion temperature, °C. fiber stress of 264 p.s.i.	75	75	74
Izod impact, ft.-lb./in. of notch	0.82	0.88	0.70

Compound	
Resin	100.0
Dibutyl tin mercaptide	3.0

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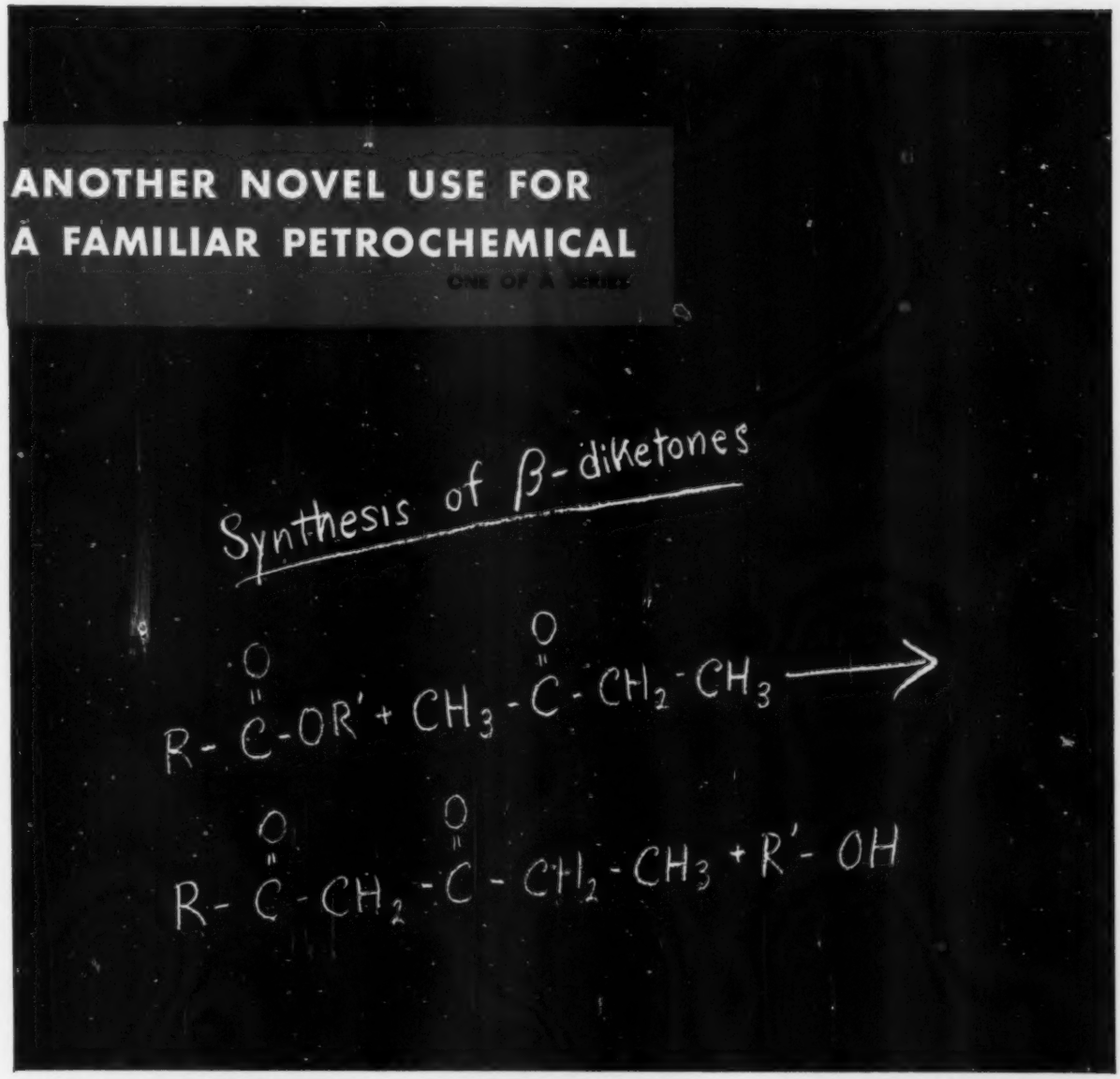

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Miniature intensive mixer

Tiny mixer made from drill press gives color dispersions in 15-g. amounts that are nearly identical with those obtained in larger machines

By Milton S. Sheftel and Gerald E. Berlyn†*

For reliable matching, colorants must be thoroughly mixed into a batch of resin. In a common procedure, a sample chip is molded from this batch and visually checked against a target. Colorant proportions are adjusted until the correct color match is attained. Each color addition requires complete remixing, and as many as 20 or 30 additions to a color are not uncommon. In the past this mixing process has usually been accomplished with laboratory-size mills, Banbury mixers, or extruders, designed to handle about a pound of material. However, the colorist often needs only 15 or 20 g. of each sample; thus a miniature hot-mixing machine that could quickly prepare a few dozen samples in this size range would be desirable. Such a machine is described here.

*President and †Development Engineer, Reed Plastics Corp., Worcester, Mass.

The Reed Miniature Mixer (RMM)[1] is derived from a standard drill press; it simulates faithfully the action of a compounding extruder, delivers 15- to 60-g. samples in 3 to 4 minutes. Some of these RMMs have been used in our laboratories on 24-hr.-a-day service for over four years.

Mechanical details

The mixer consists of a heavy steel "mortar" and rotating "pestle," also of steel (see Fig. 1, below). The shaft of the pestle is attached to the drill-press spindle with a No. 2 tapered arbor, while the pestle is bolted to the table. The press was fitted with a 1-hp. gearhead motor, for long life in service and a chain drive was substituted for the usual belt arrangement to get constancy of spindle speed (63 r.p.m.). Vertical motion and pressure for the pestle are provided by an air cylinder adapted to the rack of the drill press. For semi-automatic operation, a timer activates the air cylinder and motor switch.

[1]Patent applied for.

Both mortar and pestle are heated with mica-insulated bands that may be controlled either by autotransformers or thermoswitches. A slip-ring-and-brush assembly transmits power to the rotating heating element.

The pestle has a large shoulder that serves two purposes: it provides a bearing surface for the TFE (tetrafluoroethylene)-resin

(*To page* 233)

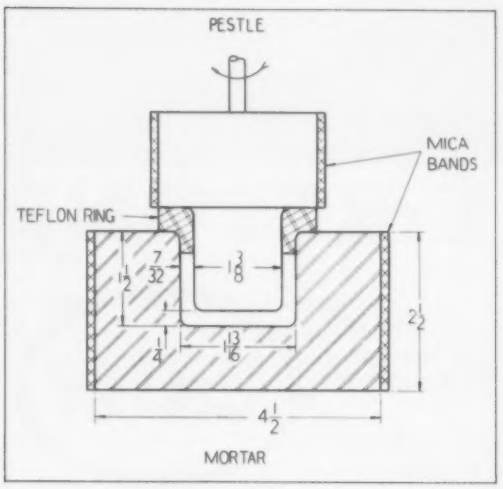

Fig. 1: Schematic diagram of miniature mixer. All dimensions are in inches

Fig. 2: The RMM, based on standard drill press. Air cylinder activates spindle

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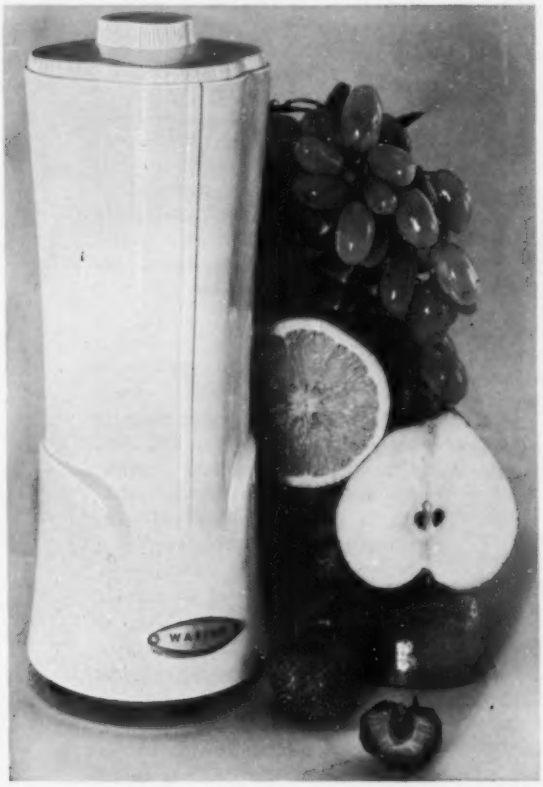
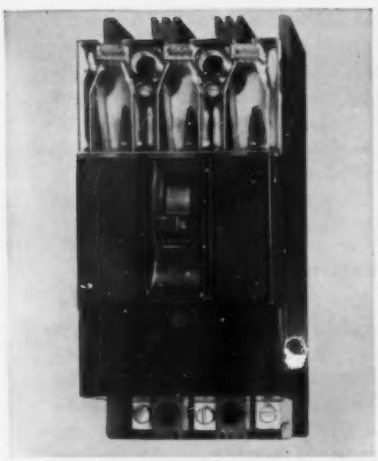


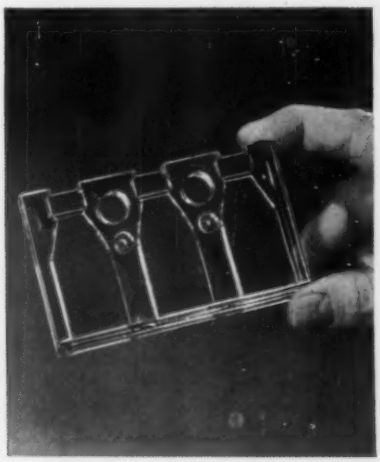
Conceived as both mixer and server of beverages and sauces, the new Waring Drink Mixer serves graciously anywhere in the home. In accord with the need for style, portability and economy, the mixing cavity, motor housing, handle and pouring spout are molded in one unit of CYMEL 1077 melamine molding compound—familiar to consumers in popular MELMAC® dinnerware. This styling in CYMEL keeps down size, weight, and cost. CYMEL provides insulation, strength, resistance to heat and staining, excellent stability, low moisture absorption, permanent rich molded-in color and hard surface.

Two complete one-piece mixer bodies are molded of CYMEL in each cycle. Mixing cavities and motor housings are formed by cores. Here, mold is open, motor housing cores have been automatically retracted, and the two mixers are being manually removed from top-cavity cores. Molder is Shaw Insulator Company.

CYMAC® Window on Circuit Breaker Contacts

A removable transparent cover through which contacts are clearly visible is the outstanding feature of a new circuit breaker recently introduced by Standard Control Division of Westinghouse Electric Company. The cover of the Saf-T-Vue circuit breaker, which reveals at a glance whether contacts are open or closed, is molded of CYMAC 201 methylstyrene acrylonitrile copolymer, which provides necessary transparency, heat and break resistance, and surface hardness at comparatively low cost.





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Effects of plasticizers on the fusion of vinyl plastisols

*By L. A. McKenna**

The vinyl plastisol industry is rapidly growing into a very large consumer of resins, plasticizers, and other raw materials. Recently, attempts have been made to make plastisol formulating less of an art and more of a science. This paper describes a simple and reliable test for determining the minimum fusion temperature of plastisols and the results obtained thereby are related to the time required for the plastisols to develop optimum strength properties under the fusion conditions selected. It is shown that the relative viscosity of a plastisol can be used as a guide to the fusion time and temperature that will be required in production.

These data should be of considerable value to plastisol formulators in guiding them to the best plasticizer combination for obtaining a desirable balance between flow properties and optimum production cycles.

Vinyl plastisols are fluid systems composed essentially of polyvinyl chloride (PVC) resin dispersed in plasticizer. It has been estimated (1)[1] that between 60 and 70 million lb. of plastisols were used in 1956 in the manufacture of such diverse items as squeezable toys, coated fabrics, spray and dip coatings of both the permanent and strippable types, and sponge. Although this figure is a relatively small portion of the total vinyl chloride type resins used in this country, plastisols represent one of the fastest growing outlets for raw materials (plasticizer as well as resin) in the vinyl field. Recent developments in the industry have led to the production of articles ranging from rigid balls to flexible foams via plastisols, and these should serve as a stimulus to increased plastisol consumption in the future.

Plastisol processing does not require heavy and expensive accessory equipment such as Banbury mixers, mills, or calenders which are normally employed in the manufacture of items from PVC compositions. By grinding or stirring dispersion-grade resin into plasticizer, a stable plastisol can be formed. In order to convert the liquid plastisol to a solid, useful article, all that is necessary is that it be placed in the position or shape desired in the end-product (such as on the surface of a dish rack to be coated or on the internal surface of a doll mold) and then heat-fused to a homogeneous solid and chilled still in the desired location.

What occurs during fusion?

The resin particles, in the neighborhood of one micron in size, are dispersed in the plasticizer during the mixing of the two ingredients. At room temperatures, most plasticizers are relatively poor solvents for the polymer and the mixture persists as a suspension of relatively low viscosity. Hence only a gradual increase in viscosity occurs with age. Were the resin to dissolve in the plasticizer the resulting true solution would be characterized by extremely high viscosity. At elevated temperatures, however, both solubility and rate of solution are much higher; the resin particles are softened, and a process of mutual solution occurs.

Thus, in practice, a plastisol is observed to increase greatly in viscosity when heated above about 50° C. until a gel stage is reached, at which point the material will no longer flow. Further heating effects the mutual solution of plasticizer and polymer, resulting in the formation of a continuous solid phase which possesses useful degrees of tensile strength and resilience. After it has been allowed to cool, this thermoplastic solid becomes even stronger.

The rate at which the gel stage is reached during fusion varies with the amount and type of plasticizer used (2). The physical properties of the fused article will vary with the degree of fusion, optimum properties being obtained only in the completely fused article. The degree of fusion, in turn, depends considerably on the time and temperature of the fusion cycle.

Doolittle (3) states that to develop optimum properties a plastisol must be fused at a temperature high enough to cause the resin particles to fuse together. The time required to attain maximum properties at any given temperature depends on the plasticizer present, the more highly solvating plasticizers requiring shorter bakes. However, curves given by Doolittle show that fusing at progressively lower temperatures results in plastisol films with progressively lower tensile strengths. Therefore, temperature is definitely the more critical of the two factors and even prolonged heating at too low a tem-

*This work was done at the Shadyside Laboratory of Barrett Div., Allied Chemical Corp. The author's present address is: Development Laboratories, Bakelite Co., Bound Brook, N. J.

[1] Numbers in parentheses link to references at end of article, p. 234.

Table I: Materials tested

Formula	*Chemical name*	*Tradename*	*Supplier*
P-1	Dimethyl phthalate	—	Eastman Chemical Products, Inc.
P-2	Diethyl phthalate	—	Kay Fries Chemicals, Inc.
P-3	Dibutyl phthalate	—	Barrett Div.
P-4	Diamyl phthalate	Experimental	Barrett Div.
P-5	Dihexyl phthalate	—	Harchem Div. Wallace & Tiernan
P-6	Dinonyl phthalate	Experimental	Barrett Div.
P-7	Diisodecyl phthalate	Elastex 90-P plasticizer	Barrett Div.
P-8	Diisooctyl phthalate	Elastex 10-P plasticizer	Barrett Div.
P-9	Bis(2-ethyl hexyl) phthalate	Elastex 28-P plasticizer	Barrett Div.
P-10	Butyl cyclohexyl phthalate	Elastex 50-B plasticizer	Barrett Div.
P-11	Butyl benzyl phthalate	Santicizer 160	Monsanto Chemical Co.
P-12	Butyl 2-ethyl hexyl phthalate	Elastex 48-P plasticizer	Barrett Div.
P-13	Butyl isodecyl phthalate	Elastex 40-P plasticizer	Barrett Div.
P-14	Di(2-ethyl hexyl) hexahydrophthalate	Flexol CC-55	Union Carbide Corp.
P-15	n-octyl n-decyl phthalate	Hercoflex 150	Hercules Powder Co.
F-1	Tricresyl phosphate	—	Monsanto Chemical Co.
F-2	Alkyl aryl phosphate	Santicizer 141	Monsanto Chemical Co.
F-3	Cresyl diphenyl phosphate	Santicizer 140	Monsanto Chemical Co.
F-4	Trioctyl phosphate	Flexol TOF	Union Carbide Corp.
A-1	Di(2-ethyl hexyl) adipate	Elastex 60-A plasticizer	Barrett Div.
A-2	Diisodecyl adipate	Elastex 20-A plasticizer	Barrett Div.
A-3	Dioctyl sebacate	Monoplex DOS	Rohm & Haas Co.
E-1	Epoxy compound	Admex 710	Archer-Daniels-Midland
E-2	Epoxy compound	Admex 711	Archer-Daniels-Midland
E-3	Epoxy compound	Admex 744	Archer-Daniels-Midland
E-4	Epoxy compound	Admex 745	Archer-Daniels-Midland
R-1	Polyester	Paraplex G-50	Rohm & Haas Co.
G-1	Diethylene glycol dibenzoate	Benzoflex 2-45	Tennessee Products & Chemical Corp.
G-2	Dipropylene glycol dibenzoate	Benzoflex 9-88	Tennessee Products & Chemical Corp.
G-3	Polyethylene glycol di(2-ethylhexoate)	Flexol 4GO	Union Carbide Corp.
O-1	Tetrahydrofurfuryl oleate	Plastolein 9250 THFO	Emery Industries, Inc.
S-1[a]	Alkyl aryl hydrocarbon	Plasticizer 136	Barrett Div.
S-2[a]	Undisclosed	Conoco H-300	Continental Oil Co.
S-3[a]	Chlorinated paraffin	Chlorowax 40	Diamond Alkali Co.
S-4[a]	Alkyl aryl hydrocarbon	HB-20	Monsanto Chemical Co.
S-5[a]	Mixed isomeric terphenyls	HB-40	Monsanto Chemical Co.
S-6[a]	Acetyl ricinoleate	Flexricin P-4	Baker Castor Oil
S-7	(Same as S-1 except that Elastex 50-B plasticizer was used as the primary plasticizer.)		

The formulations of mixed plasticizer systems are as follows:
M-1—Elastex 90-P, 28-P, and 50-B plasticizers in a 30:30:30 ratio.
M-2—Elastex 90-P and 50-B plasticizers in a 45:45 ratio.
M-3—Elastex 20-A and 50-B plasticizers in a 45:45 ratio.
M-4—Same as P-9 with 4 parts neutral calcium petronate added.

[a] Formulas S-1 through S-6 composed of 60 parts Elastex 28-P plasticizer and 30 parts of the secondary plasticizer in question.

perature will result in underfusion.

From this behavior it can be concluded that, within practical time limits, a minimum fusion temperature for a given plasticizer-resin system can be determined. This would be of considerable value to processors and fabricators who are concerned with the time and temperature needed to convert a plastisol from a liquid to a solid, more useful item.

Bergen and Darby(4) considered such a temperature in an earlier investigation concerned with Banbury processing rates. The purpose of the present article is three-fold: 1) to describe a simple and reliable method of measuring minimum fusion temperature; 2) to show how the type of plasticizer, the fusion time, and the film thickness affect this property; and 3) to show the relationship of fusion temperature to plastisol viscosity data and to commercial plastisol molding cycles.

Apparatus

The apparatus used for these experiments was a graduated-temperature melting-point bar which was modified by embedding thermocouple points directly in the bar. (Fig. 1, p. 144). This modification permits the determination of the temperature at any point along the bar more accurately than it could be measured with a surface pyrometer. Indicated temperatures along the bar were checked against the melting points of pure crystalline compounds.

Procedures

Preparation of plastisols: Plastisols were prepared by stirring the resin into the liquid plasticizer or plasticizer blend with a Brookfield counter-rotating mixer. By means of an autotransformer and timer, all samples were given the same mixing cycle except those cases of highly viscous samples which required somewhat longer mixing cycles or higher stirring speeds. The size of each batch was approximately one quart (1152 g.) and mixing was performed in 1-gal. cans. All samples were de-aerated by placing

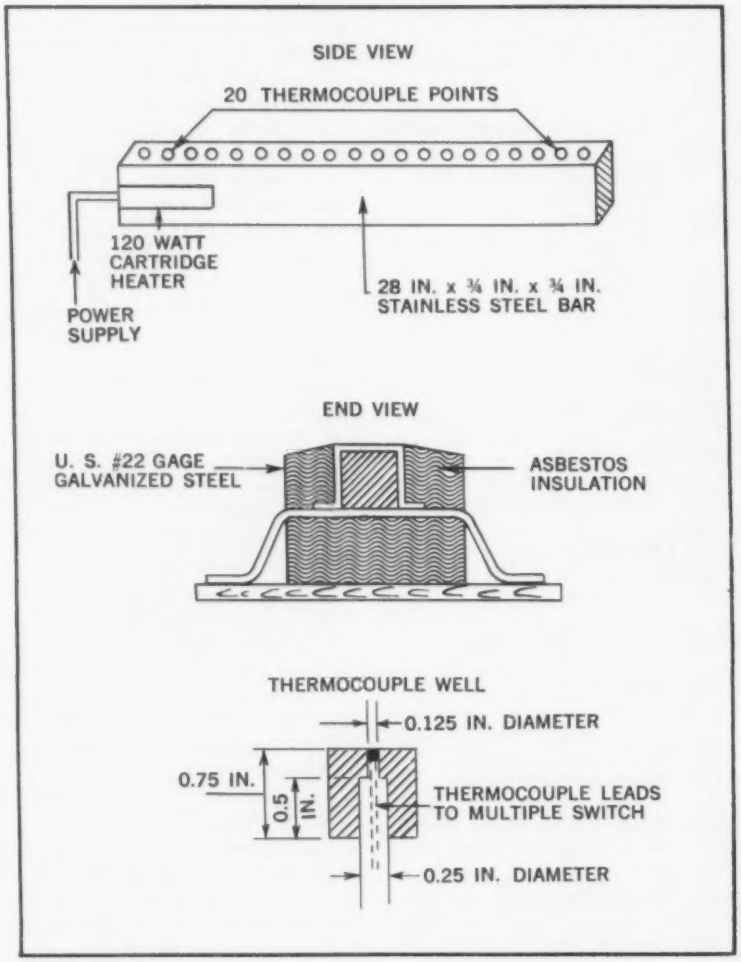

Fig. 1: Schematic diagram of fusion-temperature measuring bar with details (bottom sketch) of thermocouple installation

the 1-gal. cans in a vacuum desiccator, after which the plastisols were transferred to 1-qt. jars and stored at 23° C.

Determination of viscosity: The apparent viscosity of all samples was determined after 24-hr. storage at 23° C. A Brookfield "syncro-lectric" viscometer operating at a spindle speed of 12 r.p.m. was used throughout and all measurements were made after the spindle had been rotating for 2 minutes.

Determination of fusion temperature: The plastisol was poured onto the bar of the melting-point apparatus so that a film approximately 90 mils thick was evenly distributed over the bar. Timing was begun immediately after application of the plastisol to the bar. After 3 min. had elapsed, the fused portion of the film (at the hot end of the bar) was peeled towards the cold end of the bar with as little tension as possible until rupture of the strip occurred.

By means of a potentiometer connected to the bar, the temperature at the point at which the film broke was obtained and the average of three such values was reported as the minimum fusion temperature of the sample that was tested.

The bar was cleaned thoroughly between runs and allowed to attain an equilibrium temperature before the start of each run.

The general formulation used was:

Component	*Parts by weight*
PVC paste resin	100
Plasticizer (or blend)	90
Stabilizer	2

A list of the materials tested is shown in Table I, p. 143, along with the formulations of the mixed plasticizer systems that were tested.

Because it was immediately realized that close control of the thickness of the films under test would be extremely difficult with the apparatus being used, the effect of film thickness on fusion temperature was investigated. A Gardner[2] film casting knife was used to cast films approximately 35 mils thick directly on the bar and plastisol films about 90 mils thick were obtained by pouring the samples from a jar onto the bar. The data in Table II, below, show that, within the range tested, thickness (as determined on the fused film after completion of the

[2] Gardner Laboratory, Inc., Bethesda, Md.

Table II: Effect of film gage on fusion temperature

Compound	*Gage of fused film*	*Fusion temperature*
	in.	*°C.*
P-9	0.033	110
P-9	0.090	109
P-8	0.034	111
P-8	0.090	112

Table III: Effect of test time on fusion temperature

Compound	*Time on bar*	*Fusion temperature*
	min.	*°C.*
P-10	3	66
P-10	10	66
P-10	15	65
P-10	60	60

test) has no significant effect on fusion temperature.

A second variable investigated was the length of time that should be allowed to effect fusion of the plastisol. The data in Table III, p. 144, show that very little change in fusion temperature occurs as the time of the test increases from 3 to 15 minutes.

Although the temperatures obtained after 60 min. on the bar are significantly lower, such data can hardly be considered practical since, in practice, a plastisol's fusion cycle is seldom longer than 15 min. and in some cases, such as in high-speed knife coating of thin films, it is below even 3 minutes. Attempts to obtain data in less than 3 min. were largely unsuccessful because to do so required utilization of the extremely hot end of the bar (ca. 200° C.). Although fusion took place rapidly in this region, the resulting film was too soft to allow peeling. Extrapolation to zero time to obtain a plastisol's theoretical minimum fusion temperature (independent of time) was, therefore, impossible and it was felt that a 3-min. fusion period on the bar, before peeling, would provide fusion temperature data of practical significance.

A brief investigation into the reproducibility of this test is reported in Tables IV and V, p. 148. Table IV shows that different operators can be expected to obtain fusion temperature data that will agree to within about 2° C. of each other. Table V shows that the minimum fusion temperatures of given formulations are reproducible.

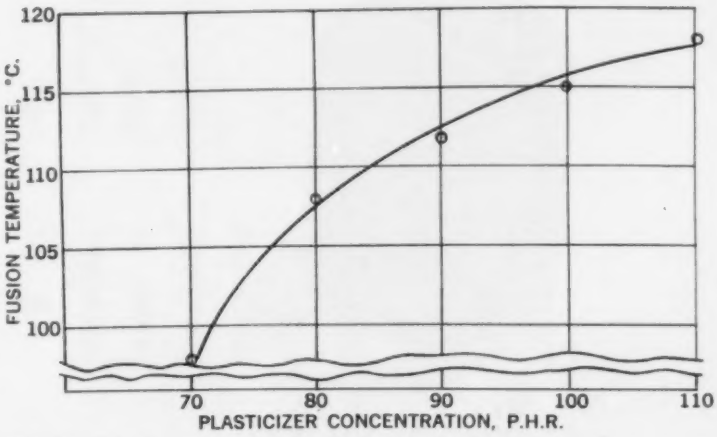

Fig. 2: Typical curve showing how fusion temperature rises as plasticizer concentration increases

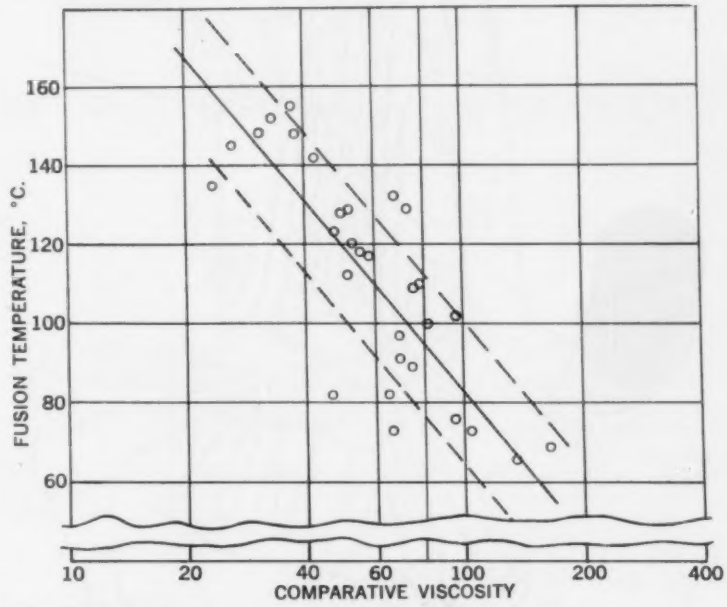

Fig. 3: Comparative viscosity (Brookfield viscosity of plastisol/viscosity of liquid ingredients alone) is a fair guide to fusion temperature of vinyl plastisols

Discussion of test results

The data obtained on 41 different plasticizer systems are presented in Table VI, p. 150. It should be noted at this point that some of the fusion temperature data in this table are slightly different from data presented earlier in this paper; the difference is attributed to the different lots of resin which were used. Fortunately, this variation in resin was discovered at the beginning of this work and all the data presented in Table VI were obtained on a single lot of resin. It is advisable to observe this precaution whenever the fusion temperatures of plastisols made up from different plasticizers are compared.

The plasticizers tested can be roughly divided into three categories with respect to the fusion temperatures they impart:

Group 1—Plasticizers yielding plastisols that fuse below 100° C.

Group 2—Plasticizer systems fusing at moderate temperatures (100 to 200° C.).

Group 3—Plasticizer systems requiring high fusion temperatures (above 120° C.).

It is easily seen that, in most cases, the plasticizers could also be grouped according to their molecular shape and polarity. Compact molecules such as dimethyl phthalate, butyl cyclohexyl phthalate, and tricresyl phosphate fall into Group 1, whereas extended molecules such as those esters derived from dibasic acids or phthalate esters made from alcohols of more than eight carbon atoms comprise Group 3. This is what would be expected from the relationship between a molecule's solvent abil-

(*To page* 148)

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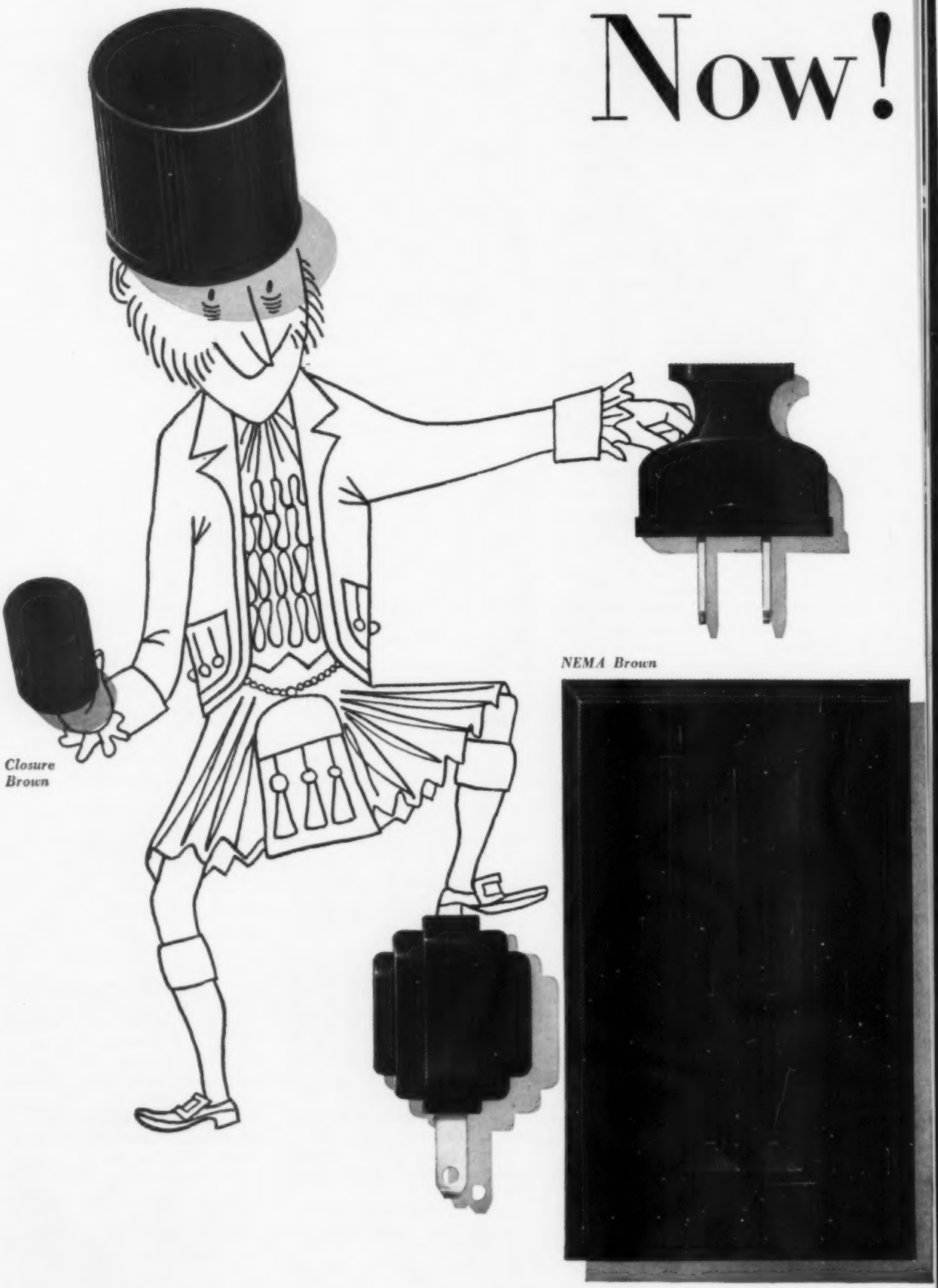

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ity and its shape(5). Thus, in going from dioctyl phthalate (P-9) to butyl octyl phthalate (P-12), the fusion temperature of the resulting plastisol is reduced eight degrees. A much more striking reduction is encountered in going from the trioctyl phosphate to the more compact tricresyl ester. Polarity apparently outweighs shape in the case of the dibenzoate esters which would normally be expected to belong to Group 2 on the basis of size considerations only.

The fusion temperature of plasticizer blends (compounds M-1 through M-3) is a function of the fusion temperatures and concentrations of the various plasticizers making up the blend. Although more data are needed to calculate accurately the fusion temperature of plasticizer blends from the fusion temperatures of component plasticizers, it is obvious that an unlimited number of fusion temperatures can conveniently be obtained by blending plasticizers with high and low fusion temperatures.

The function of a soluble petroleum salt (see Compound M-4) as an additive to vinyl foam formulations is to retard the fusion process and insure a complete blow. Careful selection of a secondary plasticizer will provide the same result while at the same time reducing the plastisol viscosity; this should help in producing low-density foams. A comparison of compounds P-9, S-1, and M-4 will demonstrate the usefulness of an alkyl aryl hydrocarbon extender in this respect.

The data in Table VII, p. 151, indicate that aging has no significant effect on fusion temperature despite the fact that the plastisols' viscosities had increased greatly (6). This behavior is regarded to be good evidence in support of the formation of a non-permanent gel network in the plastisol rather than continued solution of the resin in the plasticizer as the plastisol ages. Values in Table VII differ slightly from those appearing in Table VI. This, again, is attributed to the fact that different lots of resin were utilized in obtaining the data listed in each table.

From Fig. 2, p. 145, it can be seen that fusion temperature increases with plasticizer concentration, with the fusion temperature tending to approach a constant value above 90 p.h.r. of plasticizer. At first glance, this appears to be an anomaly since it might be expected that the solvent ability of a plasticizer would be more pronounced (and therefore would yield lower fusion temperatures) at higher concentrations. Similar behavior was also observed in the previously mentioned Banbury fusion study (4) and was attributed to the increased frictional heat effects in the less plasticized stocks offsetting any decrease in solvent power. However, the fusion of a plastisol does not involve any frictional heat and an explanation for the longer fusion times at higher plasticizer concentrations may possibly be found in one of the mechanistic theories of plasticization(7, 8). According to these theories, solvation by a plasticizer masks the active centers of a resin macromolecule and prevents the formation of a resin-resin linkage. Therefore, at high plasticizer concentrations it may be that the development of resin aggregates is retarded because active centers are blocked and are spread further apart by the solvent molecules. This being so, the

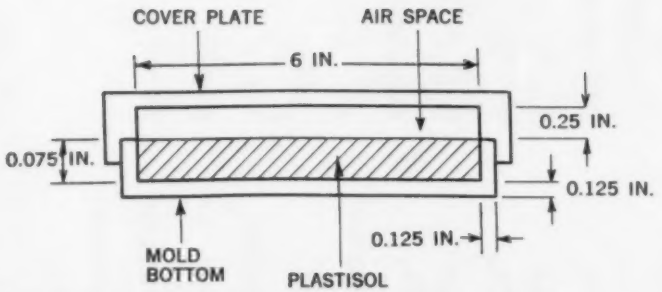

Fig. 4: Sketch of an experimental copper mold (not drawn to scale) which is used in simulating commercial plastisol molding operations

Table IV: Reproducibility of test with different operators

Material	*Parts*	*Formulation*
	AA	*BB*
PVC paste resin	100	100
Elastex 90-P plasticizer	90	
Elastex 50-B plasticizer	10	
Elastex 40-P plasticizer		80
Plasticizer 136		10
Stabilizer	2	2
Fusion temperature, °C.		
Operator #1	126	110
Operator #2	126	112

Table V: Reproducibility of test on same formulation

Compound	*Sample* [a]	*Fusion temp., °C.*
P-9	1	114
P-9	2	114
P-13	1	109
P-13	2	109

[a] Different preparations of the same formulation.

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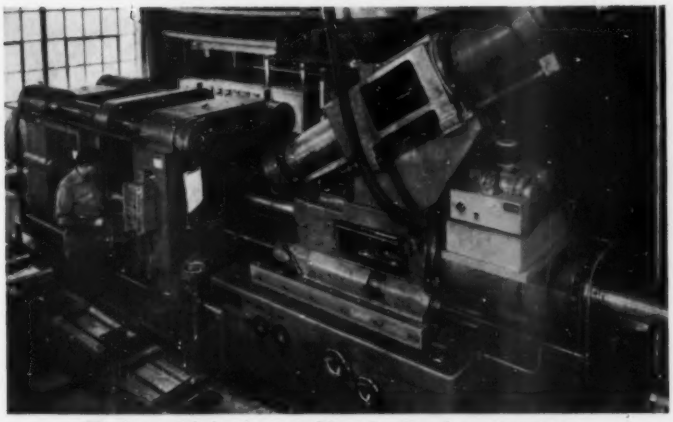

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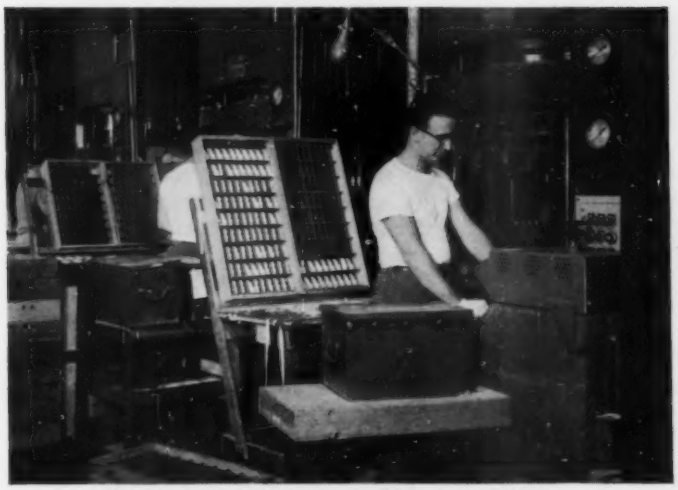

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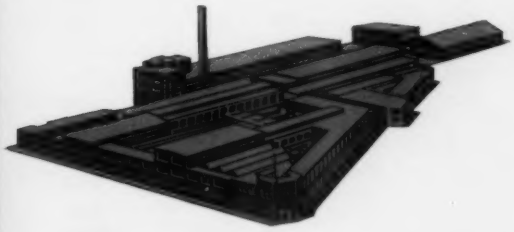

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fusion temperature should be higher.

Attempts to correlate the data obtained by this test with thermodynamic considerations of polymer-solvent interaction met with only limited success. Doty and Zable(9), in their study of the polymer-solvent interaction constant (μ) for PVC and a homologous series of phthalate esters, reported a minimum μ value at the dihexyl member. The present work indicates that fusion temperature may go through a minimum at the dibutyl ester of the same series (suggesting some correlation between μ values and fusion temperatures). The location of the minimum fusion temperature is uncertain because plastisols made from either dimethyl or diethyl phthalate formed a peculiar wax-like gel (the breaking point of which was difficult to reproduce) when fused on the bar. This behavior was

Table VI: Test data on 41 different plasticizer systems

Compound	*Fusion temp.*	*Plastisol viscosity, 24-hr.*	*Viscosity of plasticizer & stabilizer*	*Comparative viscosity*	*Fusion time at 204° C.*
	°C.	cp.	cp.		min.
P-1	65	>100,000	—	—	—
P-2	69	4150	—	—	—
P-3	63	4100	—	—	—
P-4	72	4250	—	—	—
P-5	107	2850	—	—	—
P-6	124	3900	—	—	—
P-7	130	3350	65	51.6	20.8
P-8	110	3100	40	77.5	19.1
P-9	110	3400	45	75.5	19.7
P-10	66	9100	68	134	15.1
P-11	76	3550	37.5	94.6	—
P-12	102	3300	—	—	—
P-13	102	2900	30	96.6	17.4
P-14	125	2200	30	73.4	19.9
P-15	118	1500	27.5	54.5	—
F-1	73	4900	75	65.4	—
F-2	69	2650	16	165.8	14.9
F-3	72	4750	45	105.5	14.4
F-4	123	600	12.5	48.0	19.1
A-1	133	850	12.5	68.0	19.1
A-2	156	750	20	37.5	22.0
A-3	150	650	19.5	33.3	—
E-1	136	9600	—	—	—
E-2	134	12,000	510	23.5	—
E-3	129	650	13	50.0	—
E-4	152	850	—	—	—
G-1	82	5050	78	64.7	—
G-2	82	5700	121	47.2	—
G-3	144	450	17	26.5	—
O-1	147	400	13	30.7	—
S-1	141	1050	24.5	42.8	19.2
S-2	147	1650	43	38.4	—
S-3	126	7050	—	—	—
S-4	119	1700	32.5	52.3	—
S-5	112	2550	50	51.0	—
S-6	118	1550	27.5	56.4	—
S-7	92	1800	26	69.2	14.8
M-1	97	3900	57	68.5	17.6
M-2	90	4750	63.5	74.8	16.1
M-3	101	2400	29.5	81.4	16.3
M-4	117	7950	—	—	—

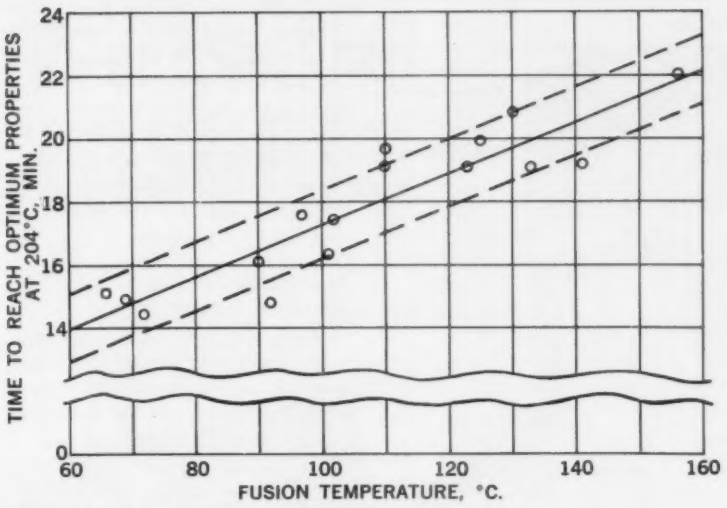

Fig. 5: Fusion time in commercial-type molding operation can be predicted rather reliably from laboratory measurements of fusion temperature

Table VII: Effect of aging on fusion temperature

Parts of Elastex 28-P plasticizer per 100 parts of resin	*Fusion temperature after*	
	1 day	*1 month*
	°C.	°C.
80	102	102
100	112	115

also observed with the low fusing phosphate esters. The fusion temperatures of the phthalates above dipropyl phthalate do, however, show good agreement with published values (10) for the solubility parameters of these liquids. Table VIII, below, lists data comparing fusion temperatures with these above mentioned thermodynamic values.

Practical significance

Because most plastisol users do not usually possess the equipment needed to determine a plastisol's minimum fusion temperature by this test, the relationship between these data and more common measurements made on plastisols was investigated. Figure 3, p. 145, shows a semilogarithmic plot of the fusion temperature versus the comparative viscosity V of the plastisol. The comparative viscosity is equal to the plastisol's viscosity divided by the viscosity of the liquid ingredients of the plastisol, all at room temperature. The correlation coefficient of this line is —0.79 and its equation is:

$t = 325 - 121 \log V$, where

t = fusion temperature, °C.

V = comparative viscosity (no units)

The standard error of the estimate for this relationship, as calculated on the basis of 30 individual points, is not quite 18° C. This means, for example, that if the estimated fusion temperature is 100° C., the true value for the fusion temperature should fall between 83° and 117° C. about ⅔ of the time. The ±17° limits establish a band indicated by the dashed lines in Fig. 3, within which the values will usually fall. Thus, viscosity measurements can be used to gain some idea as to the temperature range required to fuse a given plastisol. However, it would not be wise to use this regression to estimate fusion temperatures of plastisols whose comparative viscosities are outside the range of 20 to 200.

It is generally assumed by the trade that a plasticizer which fuses at a low temperature will process more rapidly at any operating temperature than will a plasticizer showing a high fusion temperature (i.e., poor solvating power). Since normal production procedures invariably utilize temperatures well in excess of the minimum fusion temperature of the plastisol being run, the extent to which the above assumption is true is a measure of the practical significance of fusion temperature data. It was decided to obtain some estimate of this significance in rotational molding operations and this was done in the following manner: plastisols were fused in a specially designed copper mold, 6 in. square by 0.075 in. deep, having walls 0.25 in. thick. A cover plate, also of copper, was constructed so that an air space of about 0.25 in. insulated the top surface of the plastisol being fused (Fig. 4, p. 148). Thus, the conditions of rotational molding, wherein a plastisol in a heat-conducting mold about ¼-in. thick is heated from

Table VIII: Comparison of fusion temperature with thermodynamic constants

Plasticizer	*μ at 53° C.*[a]	*Fusion temperature*	*Solubility parameter*[b]
		°C.	
Dimethyl phthalate	0.56	65	10.7
Diethyl phthalate	0.42	69	10.0
Dibutyl phthalate	—0.04	63	9.3
Diamyl phthalate	—	72	9.1
Dihexyl phthalate	—0.13	107	8.9
Dioctyl phthalate	0.01	112	—

[a] Data of Doty and Zable (9).
[b] Data of Burrell (10).

Table IX: Comparison with other data

Plasticizer	Minimum fusion temperature at 90 p.h.r.	Banbury fusion time at 50 p.h.r.[a]	Gelation temperature at 75 p.h.r.[b]
	°C.	sec.	°C.
Santicizer 141	69	49	50
Santicizer 140	72	39	—
Tricresyl phosphate	73	56	—
Santicizer 160	76	47	55
Benzoflex 9-88	82	—	52
Bis(2-ethylhexyl) phthalate	112	71	63
Flexol TOF	123	—	65
Flexol CC-55	125	—	68
Diisodecyl phthalate	130	—	70
Di(2-ethylhexyl) adipate	133	106	77
Paraplex G-50	148	283	—

[a] Data of Bergen and Darby (4). [b] Data of Todd, Esarove, and Smith (2).

one side only, were reasonably duplicated.

Slabs about 60 mils thick were fused in this mold for various times and were tested (cold) for tensile strength and ultimate elongation. Plots of these properties versus fusion time yielded the time required to obtain optimum properties in the cooled, fused plastisol under the particular conditions of test. A temperature of 204° C. (400° F.) was selected as being high enough to fuse all the plastisols studied within a reasonable length of time and, at the same time, low enough so that small differences between the plastisols could be readily detected.

The fusion times so obtained are plotted against fusion temperature in Fig. 5, p. 151. This plot has the equation:

$$\theta = 8.93 + 0.083\ t \pm 1.1 \text{ min.},$$

where θ = time of fusion to optimum strength at 204° C., minutes.

The correlation coefficient obtained for the 16 plastisols tested is 0.91. In other words, almost 82% (the square of correlation coefficient) of the variation in fusion time can be accounted for by the variation in fusion temperature. Therefore, the latter data are indeed of considerable practical significance.

The relationship between fusion time at 204° C. and relative viscosity is shown in Fig. 6, below. In this case, the correlation coefficient obtained for the 16 points is −0.75 while the standard error of estimate is listed as 1.7 minutes.

The cycle for the fusion of vinyl plastisols can thus be predicted from simple viscosity measurements with a surprising degree of accuracy. Although the equations developed in this work pertain only to the particular fusion conditions and plasticizer concentrations specified, it is believed that similar equations can easily be found to apply to cloth coating or to molding operations at other temperatures. It is believed that such equations will prove to be of considerable value to plastisol users in improving not only plant efficiency but also the quality of the finished products.

Application of data to non-plastisol formulations

Table IX, left, shows that the data obtained from this test method are in reasonably good agreement with similar data obtained by other methods. This should allow a plasticizer's minimum fusion temperature to be used as a guide in estimating the processing conditions which will be required with that plasticizer in entirely different vinyl formulations such as might be encountered in extrusion or injection molding.

Future work

Additional information along these same lines would certainly be useful. The effect of fillers of various oil-absorption values, viscosity depressants, blowing agents, and small amounts of volatile thinners or resins of different particle size should be of interest. Also, the determination of the amount of variation of fu-

(*To page* 234)

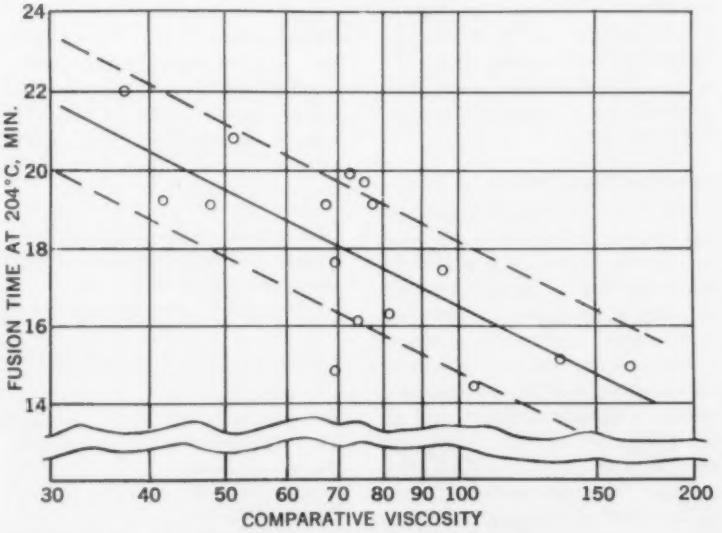

Fig. 6: It is also possible to estimate fusion time of a plastisol from Brookfield viscosity measurements, although fusion temperature (see Fig. 5, p. 151) is a better guide

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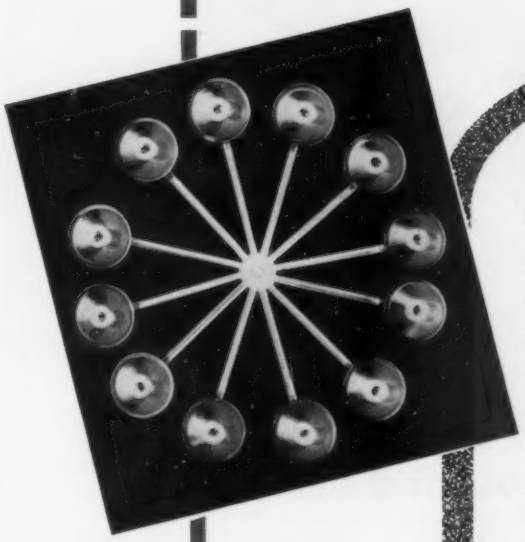

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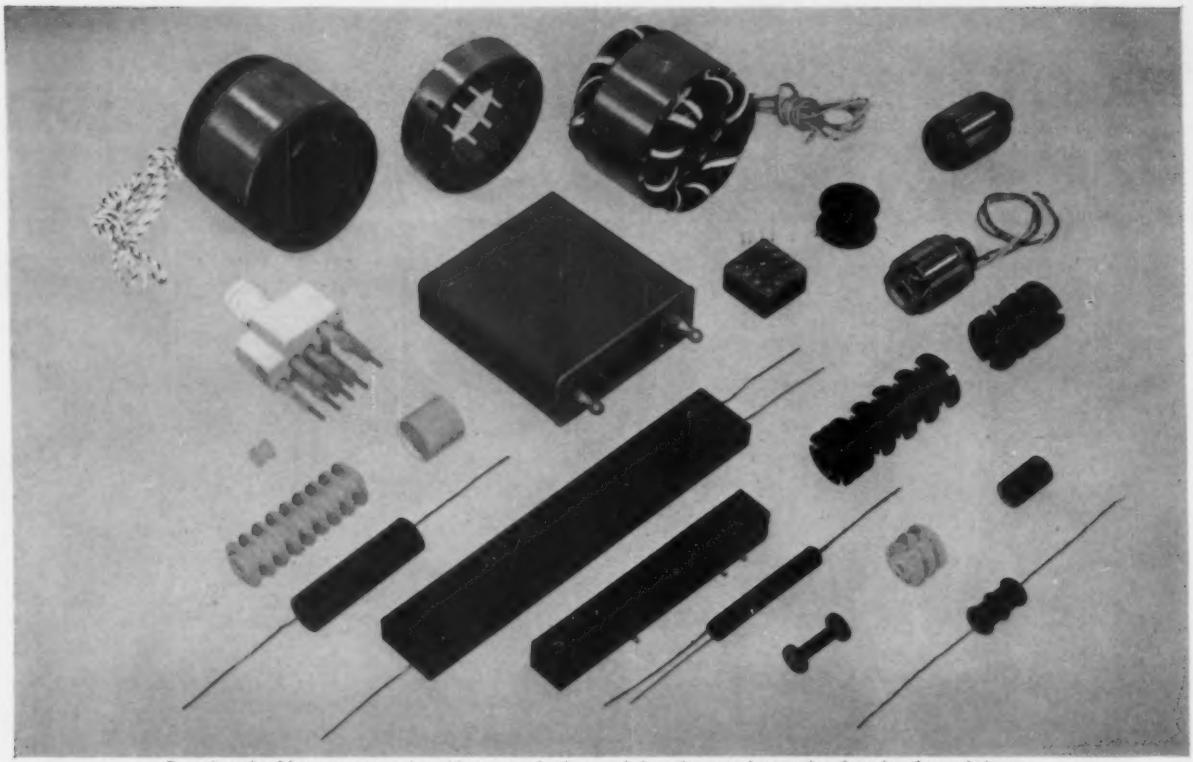

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Plastics Technical Section

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Behavior of reinforced plastics at very high temperatures

By I. J. Gruntfest† and L. H. Shenker†

The behavior of materials at high temperatures is relevant to the design of modern high-speed aircraft and missiles. To get the necessary data, experiments have been conducted using chemical flames, solar furnaces, and special electric arc devices. These experiments are reviewed and some of the results are presented. It appears that reinforced organic plastics are competitive with refractory metals and ceramics for structures that are exposed to very hot gases at temperatures of 4500° F. and higher. This may open a new application area for the plastics industry. The data presented and the interpretations offered provide a guide to future work on the complex behavior of reinforced plastics at high temperatures.

As a result of the extremely high temperatures that are generated in hypersonic flight through the atmosphere, the design of modern missiles and aircraft presents entirely new problems in materials technology. For example, at speeds nine times that of sound in air, gas temperatures over 8000° F. are generated. (1)[1] No known solid is stable at this temperature. Nevertheless, structures must be built to withstand these "impossible" conditions, for at least short periods.

Current studies, some of which are reviewed here, show that certain reinforced plastics are remarkably durable in these environments. This survey is presented to indicate the promise of plastics in this new technology. The optimum solution of the problems in this field presents an opportunity and a challenge to the entire plastics industry.

The proper evaluation of materials at extreme temperatures requires the production of these temperatures. At the higher end of the scale, some completely new concepts are needed. A recent symposium (2) included discussions of temperatures of over 1,000,000° F. It brought forth, vividly, the growing interest in and importance of high temperatures in this jet-missile-atomic-rocket-satellite age. Elevated temperatures, which have long limited man's technical progress in engines, materials, and chemical processes, must be dealt with if the needs of this age are to be met.

The particular experimental devices used in the present work include: 1) oxygen-acetylene torch, 2) oxygen-city gas torch, 3) solar furnace, and 4) water-stabilized arc. A large number of materials have been tested in each of these. Some of the devices are illustrated in the article starting on p. 105. While there are still many unknowns in this new and fascinating area, an attempt is made in the discussion to provide a basis for understanding the diverse results of the experiments.

Oxygen-acetylene torch

Since chemical flames are commonly used for the production of high temperatures and are readily

Table I: Heat fluxes obtained with an oxygen-acetylene torch[a]

Distance from torch to calorimeter	*Heat flux*
in.	*B.t.u./sec./ft.²*
2	496
1	531
½	606
⅜	624
¼ (normal operating position)	650

[a] The mixture was adjusted visually to a slightly oxidizing condition, which was found to be reproducible.

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[*] Reg. U. S. Pat. Off.

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† Aerosciences Laboratory, Missile and Ordnance Systems Dept., General Electric Co.

[1] Numbers in parentheses link to references at end of article, p. 236.

Table II: Effect of exposure of reinforced plastics to an oxygen-acetylene torch

Reinforcement	Weight loss in 30-sec. exposure: Triallyl cyanurate base polyester	Styrene base polyester	Silicone	Phenolic
	%	%	%	%
Glass fiber (mat)	34	38	24	
Hydrated aluminum oxide	53	53	46	
Aluminum oxide	100	100	30	
Magnesium oxide	33	65	8	
Boron carbide	59	87	17	
Fiberfrax			41	
Asbestos fiber			63	29
Milled glass fibers			55	
Glass cloth (horizontal orientation)			39	
Glass cloth (vertical orientation)			48	
Asbestos cloth (horizontal orientation)			57	

Table III: Weight losses of plastics exposed to oxygen-city gas torch

Material	Weight loss g./sec.	Remarks
Unfilled plastics		
Polymethyl methacrylate	0.045	No melting or carbonization
Polystyrene	0.052	Drips; carbon in gas
Polyethylene	0.043	Drips
Nylon	0.180	Drips heavily
Cast phenolic resin	0.019	Surface carbonizes; deep fissure and cracks
Vulcanized fibre	0.025	No melting or carbonization
Carbon	0.001	

	Weight loss: Before scraping g./sec.	After scraping g./sec.
Reinforced plastics		
Phenolic resin		
Paper, NEMA grade XX	0.024	0.026
Cotton, NEMA grade LE	0.023	0.026
Glass, NEMA grade G-3	0.019	0.032
Asbestos, NEMA grade AA	0.015	0.030
Nylon, NEMA grade N-1	0.017	0.019
Orlon	0.015	0.018
Epoxy resin		
Glass, MIL type GEE	0.013	0.026
Orlon	0.031	0.032
Melamine resin		
Cotton, NEMA grade MC	0.020	0.022
Glass, NEMA grade G-5	0.012	0.034
Silicone resin		
Glass, NEMA grade G-7	0.003	0.029
Diallyl phthalate resin		
Glass	0.014	high
Orlon	0.020	low
Dacron	0.020	low

available in the laboratory, they were naturally used in some of the early experiments. One of these was the oxy-acetylene torch.

A Linde 300-cu. ft./hr. unit having a 1-in.-diameter burner yielded heat transfer rates up to 650 B.t.u./sec./ft.², as determined by use of a 1½-in.-diameter water-cooled copper calorimeter (Table I, p. 155). The theoretical flame temperature for this combustion process is 6330° F. The specimens were 1½ in. in diameter by ⅝ in. thick, and were mounted on alumina tubing which in turn was mounted on a large copper block heat sink. The torch could be swung away from the specimen for ignition and cut-off of the flame. Exposures were for 30 sec. unless the material failed before that time.

The results obtained in some of these tests, which were rather limited and exploratory in nature, are listed in Table II, left. The preliminary conclusion could be drawn that under these conditions a silicone resin was superior to both the styrene and triallyl cyanurate based polyesters. A single test indicated that a phenolic resin might be superior to the silicone. A further conclusion was that the choice of filler in a composition is significant.

Oxygen-city gas torch

Another simple unit readily available in most laboratories is the glass-blowing torch which burns city gas and oxygen. A small unit of this type was used for a more extensive series of tests. Flame temperatures of 4500 to 5400° F. were generated. The water-cooled calorimeter discussed above gathered 55 B.t.u./ft.²/sec. from this device.

Specimens 1 in. in length cut from ½-in. rods of the various samples were clamped in such a way that the flame could be played on the end. The temperature of the specimen, as indicated by the color, was highest when the tip of the inner cone of the flame was on the specimen face. This condition was maintained for all of the tests. The surface temperature during testing was estimated using an optical pyrometer. Weight losses were re-

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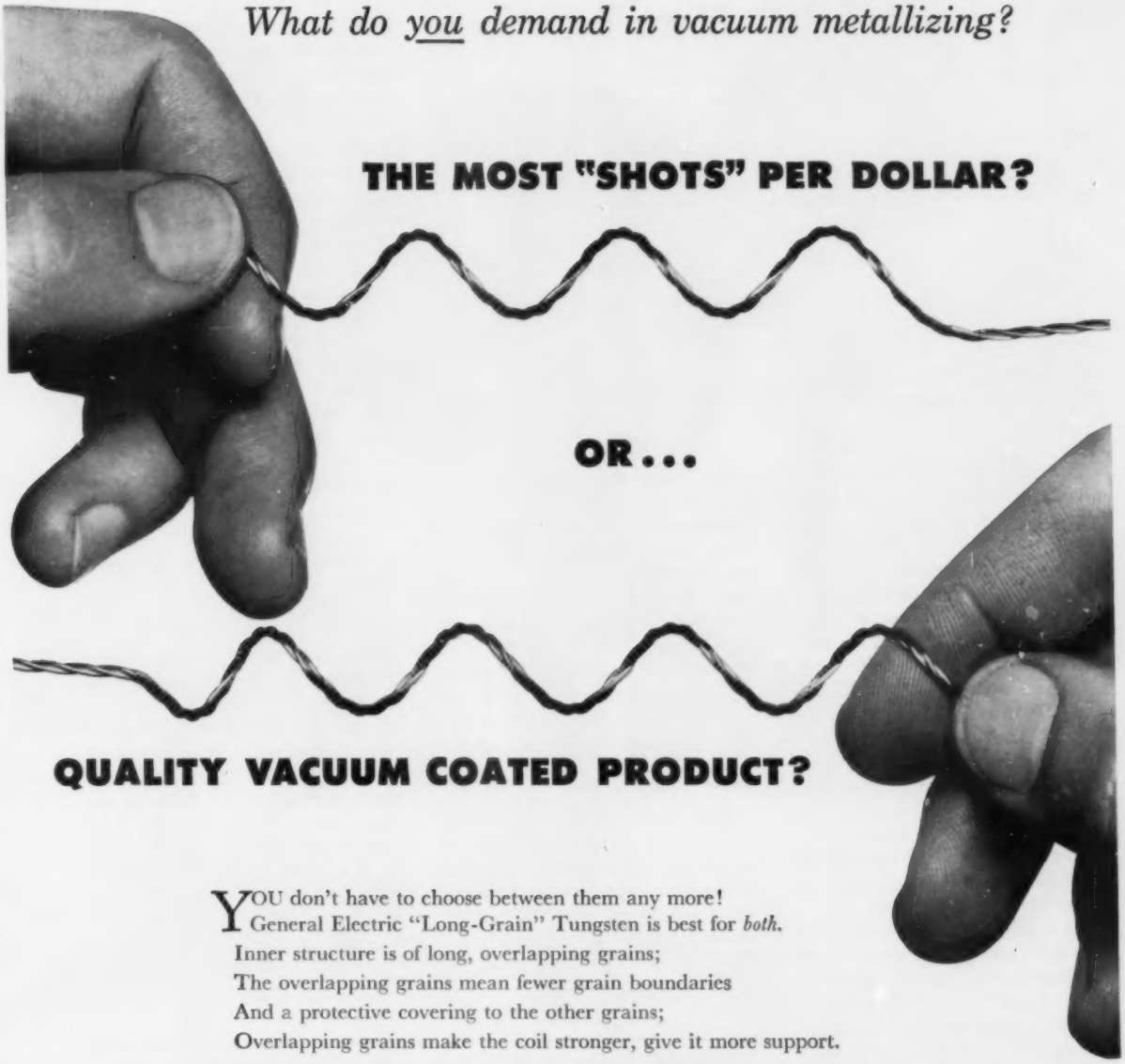

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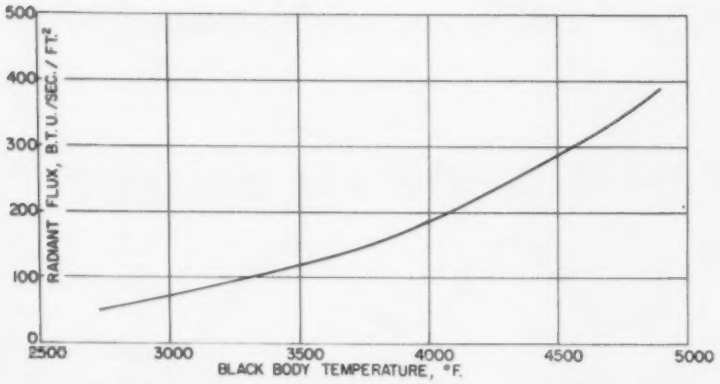

Fig. 1: Calculated black body temperatures corresponding to radiant flux available in solar furnace

corded after exposure to the flame and after removal of damaged material by scraping.

It should be noted that this torch was not capable of melting the surface of a copper rod. However, surfaces of plastics reach temperatures as high as in some more complex experiments.

Systematic variation of the angle between the torch and the sample surface did not produce much change in rate of material loss. Similarly, casual variation of the gas-oxygen ratio did not seem to affect the loss rate in any major way. Some of the results obtained in these exposures are listed in Table III, p. 156.

As would be expected at these temperatures, carbon is clearly the outstanding performer. However, under many conditions it gives troublesome mechanical failures. If it could be made more stable mechanically, if exothermic oxidations were not a problem, and if it did not have so high a thermal conductivity, it would be of much greater value in many high temperature applications.

Among the unfilled materials, phenolic resin and cellulose show the lowest weight loss; but reinforcement helps to prevent shrinkage and provide the degree of mechanical performance required in many applications..

The principal conclusion to be drawn from this series is the demonstration that weight losses, even before scraping, of organic-fiber-reinforced phenolic resins are less than those for the comparable glass-reinforced material. Furthermore, the dilution of the resin by the reinforcement of the fiber-filled plastics reduces the shrinkage and fissure development that occurs in unfilled materials. Since several of the resins were tested in more or less comparable glass-filled samples, an order of merit may be established on the basis of the weight loss on heating in the torch test. Silicone resin was best, followed by melamine, phenolic, and finally epoxy.

Solar furnace

This device is unique in that the heating can be accomplished in a controlled atmosphere so that examination of the chemical processes taking place at high temperatures is simplified. The solar furnace used in this work is capable of furnishing controlled radiant flux at densities varying between 40 and 430 B.t.u./sec./ft.² to a target which has a diameter of ½ inch.

The maximum flux density produced at the focal plane of this device corresponds to a black body temperature of 5027° F. Although no actual material exhibits true black body properties, it has been postulated that the materials tested approximate them at high temperatures. Therefore, although no record of temperatures was taken during the investigation, the values calculated for black body radiation at the specified flux densities (Fig. 1, left) may be taken as being substantially correct.

The furnace is a modified 60-in. searchlight mirror incorporating into its construction an aluminum cylinder mounted coaxially to the optical axis of the parabola. The cylinder, operated manually, can be moved along the optical axis to intercept peripheral portions of the converging rays directed from the reflector. The proportion of the radiation intercepted determines the flux available at the focal plane. Energy for the furnace is provided by a carbon arc at the focal point of a 60-in. searchlight mirror positioned to project essentially parallel rays into the parabola of the furnace. The radiant energy is then con-

Table IV: Behavior of various materials exposed to 200 B.t.u./sec./ft.² heat input in a solar furnace in an air atmosphere

Material	*Rate of weight loss*	*Heat-absorbing capacity*
	g./sec.	*B.t.u./lb.*
Phenolic-glass, NEMA grade G-3	0.0145	8530
Phenolic-nylon, NEMA grade N-1	0.0149	8340
Epoxy-glass, MIL Type GEE	0.0166	7470
Phenolic-asbestos, NEMA grade AA	0.0167	7400
Phenolic-cotton, NEMA grade LE	0.0244	5070
Phenolic-paper, NEMA grade XX	0.0275	4500
Vulcanized fibre (cellulose)	0.0339	3650
Silicone-glass, NEMA grade G-7	0.0344	3590
Phenolic-Orlon	0.0412	3000

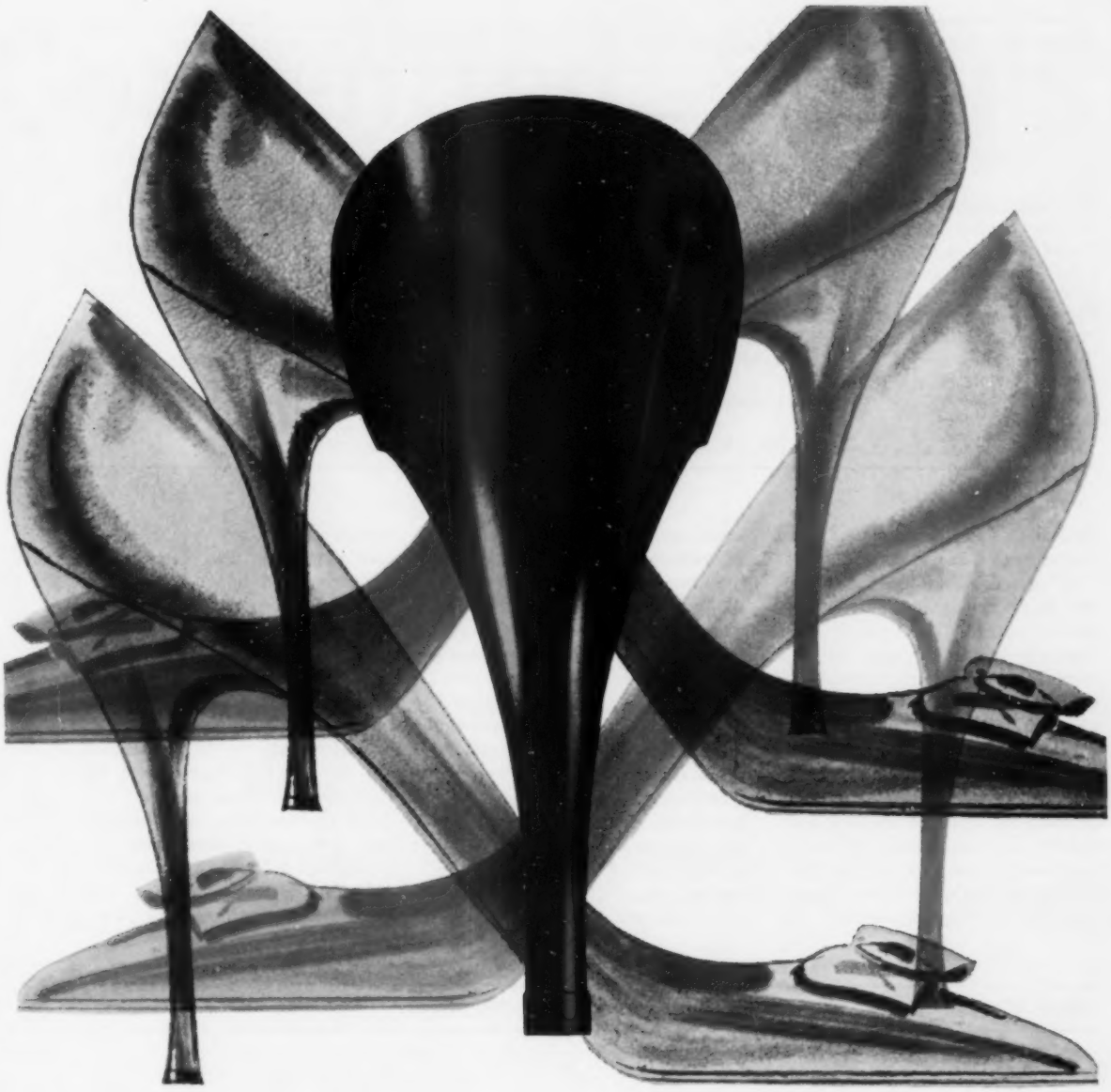

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Table V: Behavior of various materials exposed in a solar furnace in an evacuated chamber

Material	Weight loss		Pressure rise		Rank: By wt. loss		Rank: By pressure rise	
	40 flux[a]	380 flux	40 flux	380 flux	40 flux	380 flux	40 flux	380 flux
	g./sec.	g./sec.	mm. Hg	mm. Hg				
High temp. phenolic D-Refrasil[b]	0.00214	0.01328	49.6	446.0	3.34	2.16	2.07	1.71
High temp. phenolic D-nylon	0.00387	0.01795	39.5	357.0	6.05	2.91	1.65	1.37
Phenolic-asbestos, NEMA grade AA	0.00448	0.01819	34.6	426.5	7.00	2.95	1.45	1.63
Epoxy-glass, MIL type GEE	0.00446	0.01372	23.9	265.9	6.94	2.23	1.00	1.02
Silicone glass, NEMA grade G-7	0.00064	0.00616	29.3	270.5	1.00	1.00	1.23	1.04
Phenolic-paper, NEMA grade XX	0.00408	0.01955	32.8	398.7	6.38	3.17	1.37	1.53
Phenolic-glass, NEMA grade G-3	0.00200	0.01256	53.3	394.0	3.13	2.04	2.23	1.51
Vulcanized fibre (cellulose)	0.00543	0.04850	80.0	298.0	8.49	7.87	3.35	1.14
Phenolic-nylon, NEMA grade N-1	—	0.01850	—	407.0	—	3.00	—	1.56
Phenolic-Orlon	0.00784	0.04920	36.7	260.8	12.24	7.98	1.54	1.00

[a]Flux in B.t.u./sec./ft.^{2}
[b]Refrasil is a high silica glass made by H. I. Thompson Fiber Glass Co.

verged to form an image of unit magnification of the carbon arc.

A vacuum chamber consisting of a metal base plate and a transparent quartz hemisphere was used for additional tests. It was located to permit the convergent radiation to pass through the hemisphere perpendicular to its surface and to form the focal image around its center of curvature. Taken as a whole, the quartz hemisphere effected an 11% reduction in transmission of thermal energy from the source. Reduction of flux at the focal image may also have been produced by condensate on the inner surface of the hemisphere generated during the test, and by energy absorption in the vapor phase. The vacuum chamber was connected to a mechanical pump and means provided for determining pressure and volume of gas evolved.

A number of selected plastics were tested in the focal plane of the solar furnace in normal atmosphere. In each case, similar specimens of the same material were exposed, in turn, to consecutively higher flux densities for test periods of 1 minute. The loss of weight per unit time was determined for each specimen. For any particular flux density, the heat required to erode 1 lb. of material was calculated.

Tests conducted under vacuum conditions were limited to one at minimum flux density and one at maximum for each of the materials examined (that is, at 40 and 380 B.t.u./sec./ft.^{2}, discounting the effect of deposits on the dome and the vapor on the flux). After the specimen was mounted and the system evacuated, the pump was cut out of the system. Immediately, the specimen was subjected to the focal image for a

Table VI: Behavior of various materials exposed in a solar furnace

Material	Air atmosphere: Weight loss Min. flux	Air atmosphere: Weight loss Max. flux	Air atmosphere: Ratio, rate of loss of weight, max./min.	Vacuum: Weight loss Min. flux	Vacuum: Weight loss Max. flux	Vacuum: Ratio, rate of loss of weight, max./min.	Vacuum: Pressure rise, ΔP during run Min. flux	Vacuum: Pressure rise, ΔP during run Max. flux	Vacuum: Ratio, ΔP min.	Ratio, rate of loss of weight, air/vacuum Min. flux	Ratio, rate of loss of weight, air/vacuum Max. flux
	g./sec.	g./sec.		g./sec.	g./sec.		mm. Hg	mm. Hg			
Phenolic-asbestos, NEMA Grade AA	0.00850	0.03750	4.42	0.00448	0.01819	4.09	34.6	426.0	12.30	1.90	2.06
Epoxy-glass, NEMA Type GEE	0.00830	0.03540	4.27	0.00446	0.01372	3.10	23.9	265.9	11.12	1.86	2.58
Silicone glass, NEMA Grade G-7	0.00860	0.05820	6.77	0.00064	0.00616	9.62	29.3	270.5	9.23	13.45	9.45
Phenolic-paper NEMA Grade XX	0.01050	0.04810	4.58	0.00408	0.01955	4.30	32.8	398.7	12.17	2.58	2.46
Phenolic-glass, NEMA Grade G-3	0.00560	0.04500	8.04	0.00200	0.01256	6.28	53.3	394.0	7.43	2.80	3.59
Vulcanized fibre (cellulose)	0.01160	0.05740	4.94	0.00543	0.04850	8.94	80.0	298.0	3.73	1.96	1.18
Phenolic-nylon NEMA Grade N-1	0.00590	0.03220	5.46	—	0.01850	—	—	407.0	—	—	1.74
Phenolic-Orlon	0.00950	0.0612	6.44	0.00784	0.04920	6.29	36.7	260.8	7.10	1.21	1.24

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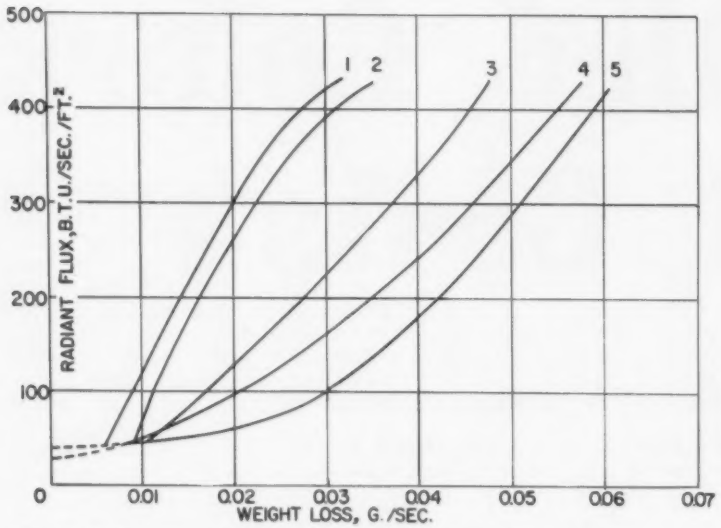

Fig. 2: Performance of specimens subjected to thermal flux in solar furnace, normal atmosphere. 1—phenolic-nylon, NEMA Grade N-1; 2—phenolic-asbestos, NEMA Grade AA; 3—phenolic-paper, NEMA Grade XX; 4—silicone-glass, NEMA Grade G-7; 5—phenolic-Orlon

1-min. period. During the run, vapors were emitted from the specimen, some of which condensed on the inner surface of the vacuum chamber. Some of the results obtained in these tests are shown in Tables IV, p. 158, V, and VI, p. 160, and Figs. 2 and 3.

Among the group of materials tested in an air atmosphere, nylon- and glass-reinforced phenolic resins show the lowest erosion rates.

For the tests carried out under vacuum conditions, it is possible to rank the various materials tested by relative weight loss or by the pressure increase in the system caused by the evolved gases. Note that the silicone-glass composition, which eroded rather rapidly in air, had the highest resistance to weight loss in the evacuated chamber. Also, considerable gas was generated from this material and the amount was essentially proportional to the flux applied. Perhaps the reflectance of this material is high, and is preserved when air is excluded during heating.

The relative performance of glass-reinforced phenolic and nylon-reinforced phenolic are changed somewhat. In the vacuum chamber the compositions containing glass are better than those containing nylon. Notice also that the performance of the epoxy-glass material is relatively better in the absence of air.

In general, the weight loss in the vacuum chamber is less than that in air. The difference can be accounted for to some extent by the reduction in flux due to the shell and the deposits that form on its inside surface. Specific effects of air on the chemistry of pyrolysis are also possible. In particular, if the deposits formed on the vacuum chamber were most important, one would expect that at the higher flux where they were heaviest, the difference would be accentuated. This effect, in general, was not observed in this investigation.

This work indicates that a "ranking" of plastics with respect to their resistance to thermal attrition can be obtained with the solar furnace. In addition, the possibility of examining the detailed chemistry of the pyrolysis process is offered. The work to date, however, has been exploratory.

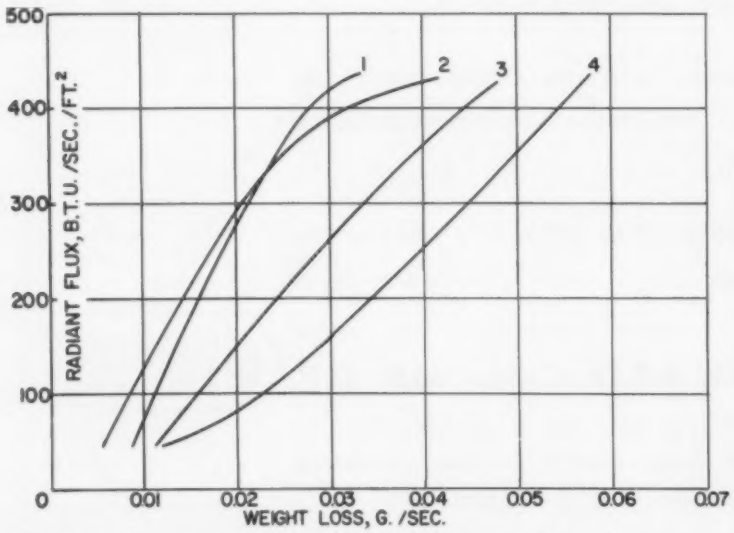

Fig. 3: Performance of specimens subjected to thermal flux in solar furnace, normal atmosphere. 1—Epoxy-glass, MIL Type GEE; 2—phenolic-glass, NEMA Grade G-3; 3—phenolic-cotton, NEMA Grade LE; 4—vulcanized fibre (cellulose)

Water-stabilized arc

For high-temperature studies this new device is becoming an important tool. Temperatures near 26,000° F. and a heat flux of the order of 2000 B.t.u./sec./ft.² can be obtained for substantial periods of time.

Fluid stabilization is a method for constraining an arc to burn along the axis of a rotating fluid. If a liquid is used as the stabilizing fluid, the temperature of the arc column may be increased by as much as a factor of seven over the 7000° F. usually obtained in a free burning arc. This is due to the increased current density arising from the restricted cross-sectional area of the vortex tube and to the cooling of the outer layers of the arc column which forces

most of the current to be conducted near the axis.

Early work on this type of unit was described by Maecker (3) and Weiss (4). A diagram of the arc device used for the materials testing described in this paper is shown in Fig. 4, right.

The arc is struck between the cylindrical carbon anode and the annular carbon cathode. The cathode is held in place by the forward plate which is at ground potential. The stabilizing fluid is admitted into the acrylic housing through channels in the forward plate and enters the acrylic turbine, or swirl chamber, through tangential openings. An opening in the rear of the swirl chamber permits the introduction of the anode and provides means for establishing the diameter of the vortex core. The excess fluid flows through this annular opening into the drain chamber and then into a pressurized metal container. The pressure is regulated in this container so as to maintain a differential throughout the system which will force the plasma to exhaust through the cathode orifice.

Four d.-c. welding generators connected in series supply the power to the arc. The arc is usually operated at 300 to 350 amp. and 200 volts. Each arc unit is equipped with an automatic electrode feed device which maintains any predetermined electrode spacing between ½ and 2 in. by preselecting the potential drop between the electrodes.

Calculations of jet velocity based on high-speed (Fastax) frame and streak photography give values in the range of 100 to 1000 m./sec. The actual value depends on the stagnation temperature and pressure developed within the arc unit. The stagnation pressure in the vortex core of the water-stabilized arc is between 0.1 and 5.0 p.s.i.g. The composition at the center of the jet has been estimated to be as follows: 10% vaporized carbon, 5% carbon particles, 25% water vapor, 50% dissociated water vapor, and 10% ionized atoms and molecules.

The electrical properties of the plasma are related primarily to the temperature, which at 22,000° F. results in approximately 10% ionization. Although the arc column is electrically neutral, the jet is observed to carry a net positive charge as indicated by an electrometer.

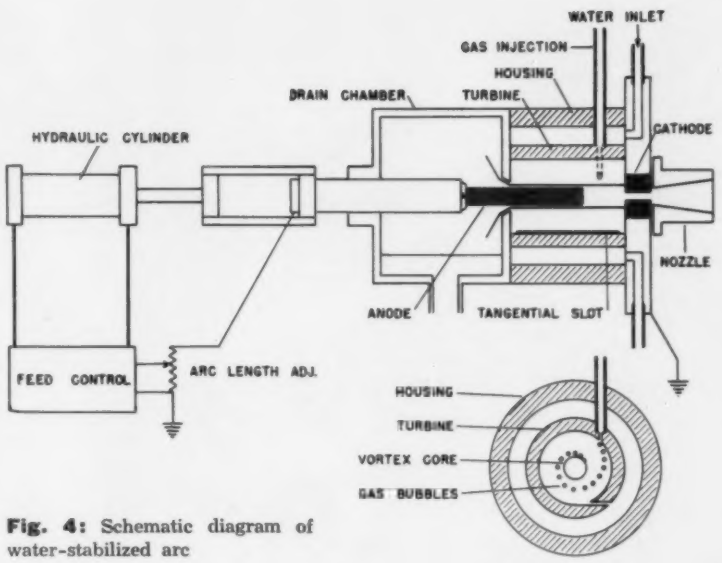

Fig. 4: Schematic diagram of water-stabilized arc

Three methods have been employed in determining the temperature of the exhaust plasma. These methods are based on spectroscopic data and hence depend on conclusions about the temperature which one makes from measurements of the radiation of atoms, molecules, ions, etc. The values obtained for the plasma temperature by these methods at 0.2 in. from the cathode ranged from 12,300 to 22,000° F. The discrepancies among these values may be due to the fact that each method involves spectra emitted from different zones within the jet. There is also the possibility that thermal equilibrium is not attained in the regions which were observed.

In all cases, the flat end of a ½-in. cylindrical rod of the material under test was exposed to the stream of plasma from the arc. In order to offer a definable surface area to the attack of the hot gas, protective sleeves of polymethyl methacrylate were used. In this way, variation of exposed surface and angle of attack during test was minimized. All the tests were made with the end of the specimens 1 in. from the orifice of the device. The orifice was 5/16 in. in diameter at the start of each run. Clearly, other orifice-model spacings could be used so that a range of temperatures and heat fluxes would be available.

The results of various arc plasma tests are shown in Table VII, p. 166. All runs were made at a power input very close to 63 kw. for a period of close to 10 seconds. All results are reported as milligrams weight loss per kilowatt-second of total energy input to the device, in order to cancel the effect of small variations in power input and exposure time. Each line separating data on a given material indicates a distinct series of tests, the values reported being an average of a group of identical samples.

In most cases the materials were designed for a very different function than the very high temperature exposures involved here. The fact that a high erosion rate is found does not reflect on the suitability of the material in the use for which it is intended.

Test results

A number of interesting observations can be made based on tests in this facility.

Reinforced phenolic resins: Although this class includes the best plastics tested to date, phenolic resins are by no means uniformly good at this temperature. In the plasma generated by the stabilized arc, the compositions with

(*To page* 166)

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A Word About Celanese Fortiflex . . .

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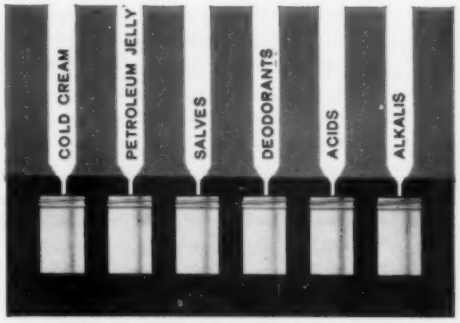

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Fortiflex...a Celanese linear polyolefin

lower percentages of glass reinforcement were superior and the organic-fiber-reinforced plastic gave the best performance. At much lower temperatures, say 4000° F., other tests not described here have shown that the reverse is likely to be true. There, the composition with the highest glass content showed the lowest weight loss, and the organic-fiber-reinforced material gave the poorest performance.

This outcome can be rationalized in several ways. It is possible to make dependable estimates of the energy required to raise the temperature of a particular weight of various materials to 10,000° F. or thereabouts, by an equilibrium process. An estimate of this type provides an upper limit to the heat-absorbing capacity for the material when it is used in exposures to this high temperature. Such a calculation indicates that, aside from hydrogen, which cannot be used to build anything, organic plastics have the highest theoretical heat-absorbing capacities. The effective heat-absorbing capacity of a particular composition may be much lower, however, because of the non-equilibrium nature of the usual exposure.

Since gases generated by a heated material may act as a convective and radiative heat-transfer barrier, a similar calculation can be made for the volume of gas generated by various materials heated to 10,000° F. in an equilibrium process. Again hydrogen and hydrogen compounds give the highest values. Since among structural materials the organic plastics may have the highest hydrogen content, these plastics give the highest theoretical gas volumes.

In experiments to date, the optimum performance has been obtained from resins that produce a high yield of carbon when they are heated. This carbon is a refractory residue which may protect the underlying material from the hot gas of the environment to a certain extent, and may also provide a hot reaction zone in which the primary gaseous products are brought closer to thermal equilibrium.

Table VII: Behavior of various materials exposed to a water-stabilized arc

Material	*Weight loss*
	mg./kw.-sec.
Phenolic-Fiberglas	
Chopped glass cloth; high temp. phenolic B	6.0
Chopped glass cloth; high temp. phenolic C	6.7
Chopped glass cloth; high temp. phenolic D, 27% resin	2.7
Chopped glass cloth; high temp. phenolic D, 37% resin	2.2
Chopped glass cloth; high temp. phenolic D, 44% resin	2.2
Chopped glass cloth; high temp. phenolic D, 65% resin	1.5
Phenolic-Refrasil	
Chopped refrasil cloth; high temp. phenolic D, 41% resin	2.3
Phenolic-organic reinforcement	
Orlon fiber AF; high temp. phenolic resin D	1.3
Chopped nylon cloth; high temp. phenolic resin D, 57% resin	1.1
General-purpose wood-flour-filled molding compound	5.3
Phenolic-asbestos	
Acid leached asbestos; high temp. phenolic resin E	2.1
Acid leached asbestos; high temp. phenolic resin F	2.9
Asbestos mat; high temp. phenolic resin G	6.3
Molding compound; high temp. phenolic resin H	7.0
Molding compound; high temp. phenolic resin G	6.5
Chopped asbestos fabric; high temp. phenolic resin I	2.1
MIL type MFG molding compound	2.4
Molding compound; high temp. phenolic resin K	1.7
Phenolic-magnesium oxide	
Graded MgO filler	1.8
Melamine-Fiberglas	
NEMA grade G-5 (medium weave glass cloth); supplier No. 1	5.4
Same, supplier No. 2	3.6
Melamine-cotton	
NEMA grade MC; supplier No. 2	2.6
Silicone-Fiberglas	
NEMA grade G-7	3.3
Chopped glass fiber molding compound	2.9
Epoxy-Fiberglas	
Electrical grade laminate	2.3
Epoxy—pyromellitic dianhydride in fiberglas, 31% resin	3.0
Hard rubber	
No carbon	2.8
60% carbon	4.0
Vulcanized fibre	2.7
Copper rod	60.0
Good grade of graphite	0.9

Lowest erosion rates

These experiments indicate that phenolic resins give the lowest erosion rates under these test conditions. However, it would be unreasonable to decide that this is the only class of resin that must be considered for application at these temperatures, since phenolics from different suppliers showed as much variation in performance among themselves as was shown in a group of resins including melamine, silicone, and phenolic types. In other words, it is possible that the superiority of certain phenolics merely reflects the larger amount of development effort that has been expenders on them.

On the other hand it should be noted that on the basis of resin chemistry, phenolics can be expected to give higher yields of carbon than the other resins mentioned, and this may constitute a significant basis for their advantage.

The selection of a fiber rein-

(*To page* 235)

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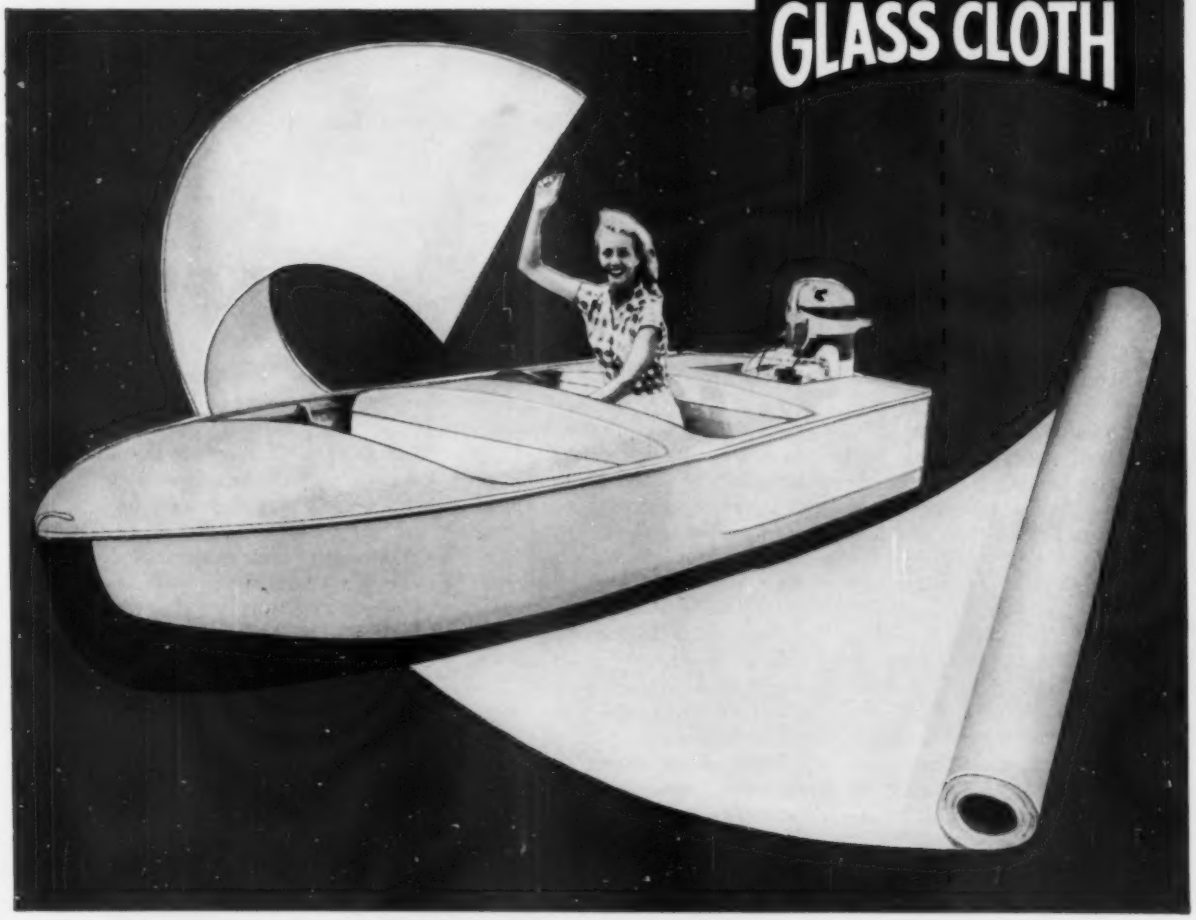

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Vinyltoluene for polyester premix putties

*By R. F. Helmreich**

Perhaps the most promising area in compression molding is that dealing with reinforced polyester premix compounds. By their use, the time-consuming and costly hand lay-up of mats on a mold may be avoided. They make possible the employment of reinforced plastics where they were previously uneconomical. Premix putties are the most practical way to mold polyester objects with varying thickness in cross-section, or with metal inserts. Realization of their promise is seen in their phenomenal growth: The amount of polyester going into reinforced molding compounds has consistently increased, and may become more than one-half the amount consumed by the whole reinforced plastics industry within another year.

Another reason premix putties are attractive to fabricators is their simplicity of manufacture. They are made by mixing together polyester resin, catalysts, pigments, fillers, short fiber reinforcing agents such as glass or sisal, and internal mold lubricants. The dry filler (clay, calcium carbonate, etc.) and the lubricant (stearic acid, zinc stearate) are blended. The resin, catalyst, and pigment are added and mixed thoroughly. The reinforcing fibers are then added and thoroughly dispersed in the compound. All of this is carried out in an intensive blade mixer.

*The Dow Chemical Co.

Monomers for premixes

Three monomers predominate in premix polyesters: They are styrene, vinyltoluene, and diallyl phthalate. Each of these has advantages and disadvantages. They all form premix putties which are easily extruded into preform slugs of specified weight or volume. The molding operation is a simple matter of closing a mold on the preformed slugs. No after-cooling of the mold is needed, and only a minimum of open time is required between dropping the slug and closing the mold (Figs. 1-3).

None of the three monomers eliminates the problem of slow cure. The cure time for any of these polyester premix putties is about 1 min., while the average dwell time of a metal piece in stamping equipment is a few seconds. Still, it must be remembered that polyester premixes for low-pressure molding require only one-third to one-half the time and labor needed for the wet lay-up of polyester laminates.

A problem in the use of these monomers arises during premix compounding. Because the shearing action of the mixer generates heat, volatile monomers in the polyester resin may boil off if the temperature is not controlled. This problem of volatility should be an important consideration in the choice of monomer for a premix putty.

While the three monomers do have similarities, their costs and physical properties are different, and this makes the decision on styrene, vinyltoluene, or diallyl phthalate a matter of real concern. Diallyl phthalate is costly, but has a high boiling point and is excellent for rigid, resilient end-products. Styrene is low in cost, but has a low boiling point and a high volatility which causes

Fig. 1: Premix polyester putties permit processor to weigh out precise amounts of material in advance of the molding operation

Irons shown—General Electric Spray, Steam and Dry Iron (Model #F-61).

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Fig. 2: Premix charge is placed on male half of compression mold

loss of the styrene during premix, storage, and molding. Vinyltoluene, another member of the styrene family, has different properties from styrene itself because of its methyl-substituted benzene ring, but its price is only nominally above that of styrene.

Vinyltoluene is now being recognized by fabricators as having many of the advantages of styrene while lacking its primary disadvantage. This statement is generally true, even in the face of the wide variations to be found in commercially available polyester resins. A look at a few important properties reveals the advantages of vinyltoluene over styrene.

Property comparisons

Boiling point (vinyltoluene—341° F., styrene—293° F.): The 48-degree advantage of vinyltoluene permits higher molding temperatures, faster cycles, and reduced overall cure time. These higher temperatures may be used without the porosity or fracture which might result with styrene under the same conditions.

Resin cure time: Vinyltoluene used in premix molding putties usually results in a shorter cure time than does styrene, even at equal temperatures. Eight unsaturated ester polymers from four suppliers were tested for gel and cure time. With seven of the resins, the time was reduced by 10 to 30% when vinyltoluene was the monomer.

Vapor pressure (vinyltoluene—2mm. Hg at 77° F., styrene—6.6 mm. Hg at 77° F.): This threefold advantage of vinyltoluene in vapor pressure correlates with the difference in boiling points. At equal concentrations in polyesters, vinyltoluene will evaporate from a surface only one-third as fast as will styrene. This cuts losses during mixing and reduces crusting of the preform slugs. For equal amounts of monomer, the lower vapor pressure of vinyltoluene results in a lower atmospheric vapor concentration than does styrene. A monomer vapor concentration of 100 p.p.m. or less in air maintains a safe, comfortable working environment, and it is easier to maintain this low level with vinyltoluene.

Flash point (vinyltoluene—140° F., styrene—88° F.): These values were obtained by the Cleveland open cup method. The flash point of styrene is only 8 degrees above the ICC classification of a flammable organic material. Vinyltoluene is 52 degrees above styrene, and its use reduces the hazard of flash ignition and fire.

Comparison of the properties of vinyltoluene and styrene in premix molding compounds could be further expanded, but the characteristics of the two are similar in most other respects. The comparisons already made are reason enough for many fabricators to accept vinyltoluene as a superior monomer in formulating low-cost, premix polyester molding compounds.—END

Fig. 3: Finished part (planter) is removed from press. (Photos, Dow)

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Epoxy resins
as cryogenic structural adhesives

By R. M. McClintock and M. J. Hiza**

Data on various properties of a filled epoxy resin are given for temperatures down to 20° K. Tensile and shear strengths of copper-to-copper bonds were measured under various conditions of test and pretest temperature and bond thickness. Impact strength of the cured adhesive in bulk was determined at 300 and 76° K. Thermal expansion of the cured adhesive was measured between 76 and 300° K.

This investigation of copper-to-copper bonds using filled epoxy resins as adhesives was undertaken to provide design information for a liquid hydrogen cooled electromagnet. It was proposed that the adjacent coils of the magnet be spaced with an epoxy resin adhesive which would provide structural rigidity as well as electrical insulation at the operating temperature of 20° K. (−253° C.). Since the completed coil would be acted upon by thermal stresses and electrical reaction forces, the present program was undertaken to evaluate the mechanical strength of several adhesives subjected to treatment corresponding to use in the end application.

The use of filled epoxy resin adhesives was suggested for the magnet application on the basis of purely pragmatic information obtained in an earlier search for an adhesive useful at temperatures as low as 4° K. When it was found that these adhesives exhibited desirable low-temperature properties, it was decided that their use in the above application only required verification of the fact that properties of the bond are not seriously harmed by some of the treatment the completed assembly would receive. In short, this study is more the evaluation of the effects of some engineering variables upon the properties of a few commercially available adhesives than it is an attempt to tailor an optimum cryogenic adhesive.

A point worth emphasizing is that the term "epoxy resin" refers to a series of polymers, each capable of reaction with many curing agents to produce cross-linked solids with possibly quite different properties. Consequently, while the results presented here are thought to be indicative of the behavior of most epoxy resin adhesives, it should be understood that they are known to be valid only for the few resins tested.

These adhesives were two-component systems consisting of a liquid amine type curing agent and an epoxy resin paste containing an inorganic filler material. The filler was predominantly alumina and asbestos, totalling approximately 55% of the resin-filler mixture. The curing agent used was diethylaminopropylamine, a relatively slow reacting type recommended for elevated-temperature curing.

The following groups of experiments were performed: 1) the impact strength of the cured adhesive in bulk was measured at 300 and 76° K.; 2) the thermal expansion of the cured adhesive between 76 and 300° K. was measured; 3) tensile and shear strengths of copper-to-copper bonds were measured at 300, 76, and 20° K. after rapid cooling to these temperatures; and, using room-temperature tensile and shear strengths as indices, the effects of 4) exposure to high temperatures, 5) exposure to low temperatures, and 6) adhesive thicknesses were determined.

Test procedures

The tensile and shear specimens (Fig. 1, below) were fabricated from commercial electrolytic tough pitch copper. With an adhesive thickness of 0.020 in. in the shear specimen, the center line of the adhesive coincided with the axis of the threaded ends. The tensile specimens were designed to give a circular cross section 0.750 in. in diameter with bonded surfaces perpendicular to the axis of loading. The end threads on both specimens were standard ¾

Fig. 1: Specimens for adhesive test. Top to bottom—impact, tensile, and shear

This work was supported by the U. S. Atomic Energy Commission.
*Cryogenic Engineering Laboratory, National Bureau of Standards.

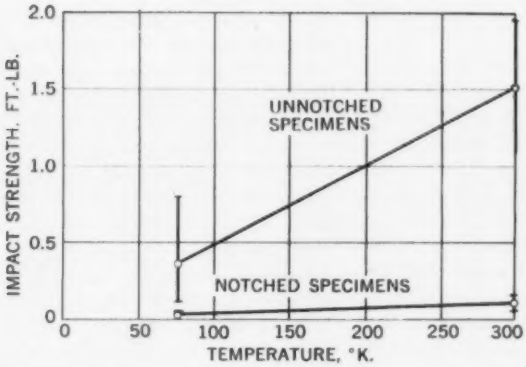


Fig. 2: Impact strength of a filled epoxy resin vs. temperature

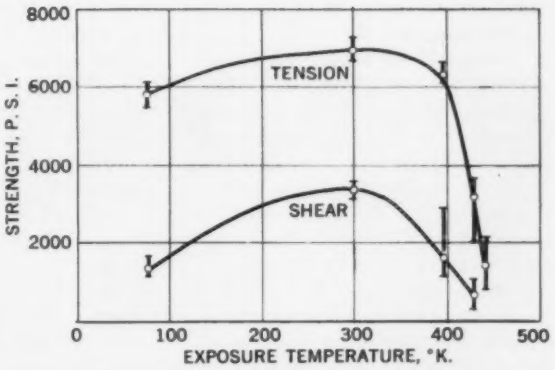


Fig. 3: Strength of filled epoxy adhesive bond vs. temperature prior to testing at room temperature

in. -10, and were lathe-cut in all cases to insure concentricity with the axis of the specimen.

The same method of preparing the copper surfaces to receive the adhesive was used for all specimens. The machined surface was first degreased with carbon tetrachloride. Wet crocus cloth under running water was then used to remove oxide and salt deposits and a rinse was performed in distilled water. The surface was then etched for about 1 min. in a room-temperature solution composed of 15 ml. $FeCl_3$ (42% aqueous solution), 30 ml. HNO_3 (15N), and 197 ml. H_2O. The specimens were then given a final rinse in distilled water and dabbed dry with tissue. If deposits could still be seen on the surface the process was repeated. The adhesive bonds were made as soon as possible after this cleaning process was completed to prevent the formation of oxide on the surface.

Tensile loading of the specimens was done in a hydraulic tensile testing machine at a cross-head movement not exceeding 0.05 in./min. A bath of liquid nitrogen or liquid hydrogen surrounded the specimens for the tests performed at 76 and 20° K., and in all cases chain links were interposed between specimens and the machine cross-heads to minimize bending loads.

Specimens subjected to elevated temperatures prior to testing were maintained at the temperatures noted in the results for 8 hr. in a helium atmosphere. Those subjected to low temperatures prior to testing were alternately cooled and warmed twice between 76 and 300° K. by immersion in liquid nitrogen and warming in ambient air to room temperature. Cooling and heating rates were consequently quite high.

Figure 1 also shows the specimen used for conducting Charpy impact tests on the cured adhesive in bulk. The specimens were cast over-size in aluminum foil molds, cured, and machined to the proper dimensions. Tests were performed both on notched and unnotched specimens. Bubble entrainment was minimized by vacuum curing, but some small bubbles were still present in the cured specimens. The testing was done in a standard plastics impact testing machine. Low-temperature tests were performed sufficiently fast after removal from liquid nitrogen that the temperature rise was no greater than 3° K.

As it turned out, the impact strength was so low that the kinetic energy imparted to the broken pieces accounted for the major portion of the indicated strength at the lower values. This was eliminated from the results by replacing the broken ends in the machine and noting the energy required to accelerate them by the swinging pendulum. The impact energy required to break the specimens, shown in Fig. 2, above, therefore, are accurate to perhaps only 50%, but they do show notch sensitivity of the material as well as increased brittleness that takes place with decreasing temperature.

Tensile and shear strengths

Although tensile and shear strengths vary somewhat with the dimensions and configuration of an adhesive bond (1)[1], these two properties of a well designed test specimen are still useful indices for observing the effects of other variables. The tensile and shear specimens used in this study were designed to allow not only the evaluation of some of the pertinent variables relating to the intended use by comparing relative values, but also to provide useful design figures since these specimens approximated the ge-

[1] Numbers in parentheses link to references at end of article, p. 237.

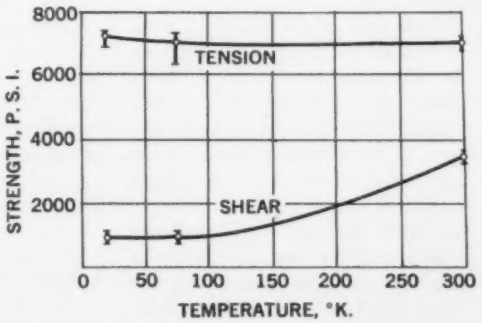


Fig. 4: Strength of a filled epoxy adhesive bond vs. temperature

ometry and material of the proposed magnet coil.

Nearly all the tensile specimens failed near the center of the glue line so that considerable adhesive remained on both broken halves. The exceptions to this cohesive type of failure were the specimens that had been subjected to temperatures above the cure temperature prior to testing at room temperature. As exposure temperature was increased, these specimens showed a change in mode of failure from cohesion to what was apparently a failure of the bond between metal and adhesive. (The only inspection of the surfaces after testing was visual, however, so that a very thin layer of remaining adhesive would not have been detected.) Tensile specimens given a pretest exposure at 423° K. (150° C.) and subsequently tested at 300° K. showed about a 90% cohesive failure with the remainder of the failure occurring adhesively. The specimens that had been subjected to 438° K. (165° C.) failed only about 50% cohesively.

The decrease in strength of tensile specimens treated in this way shows that while elevated temperatures cause chemical damage to the adhesive material itself, there is a temperature above which more serious damage occurs to the adhesive bond. This is apparently caused either from chemical damage to the molecular bond between metal and adhesive or from thermal stresses at the high temperatures which are great enough to cause local failures of the bond, or both (Fig. 3, p. 173).

Without exception, the shear specimens tested under all conditions fractured in such a way as to leave the entire thickness of adhesive on one half of the specimen in any given local area. The other half in this area contained either no adhesive or such a thin film that it could not be detected by visual examination. It was at first suspected that the molecular bond between metal and adhesive was weaker in shear than the adhesive itself, and so always allowed failure at the metal-adhesive interface before the shear strength of the adhesive itself was attained. But small metal fragments often torn from the copper surfaces by the adhesive testify to a bond between metal and adhesive strong enough to consider another possibility. It may also be that the fracture actually occurred in the body of the adhesive while always leaving at least a monomolecular layer of adhesive on one metal surface. If we consider the fact that the thermal stresses in the adhesive are a maximum near the metal-adhesive interface and decrease toward the center of the adhesive layer, we realize that a superimposed mechanical shear should produce failure in a plane very near the interface. Such thermal stress exists, of course, even in specimens tested at room temperature, if the adhesive has been cured at an elevated temperature. In fact, cure shrinkage establishes some initial stress even in bonds cured at room temperature. The obvious remedy for such steady state thermal stresses is to match the thermal expansion of the cured adhesive with that of the metal.

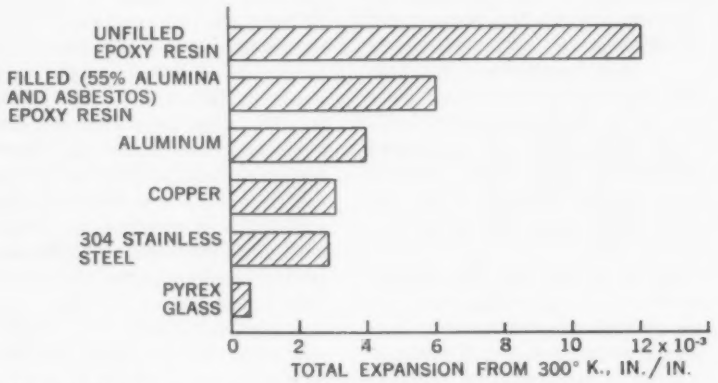


Fig. 5: Thermal expansion of some adhesives and adherends

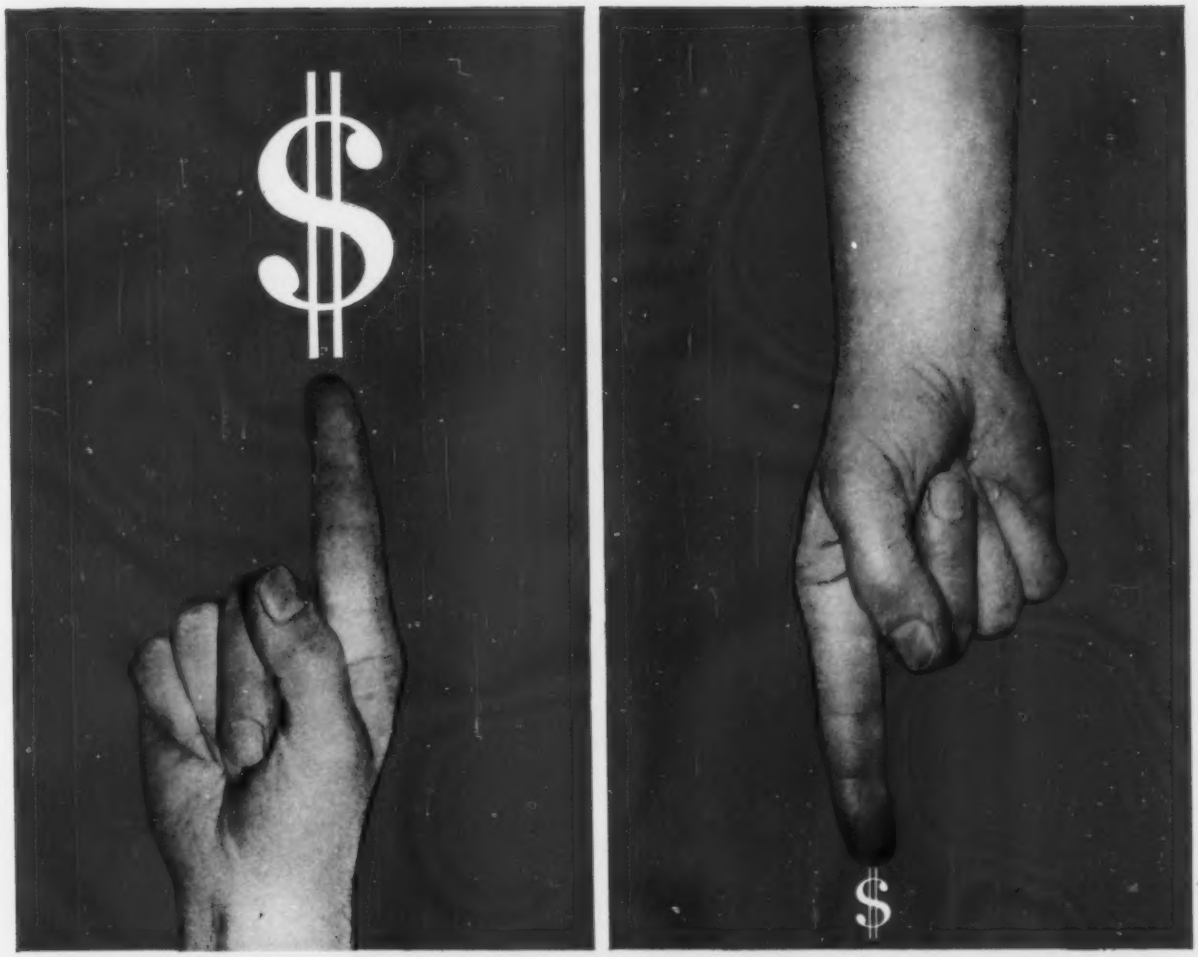
Figure 3 shows average values of tensile and shear strengths at 300° K. as a function of the pretest treatment. The sharply diminished strengths caused by elevated temperatures are clearly shown, but a related effect of temperature that is not shown on this graph is the ease with which the adhesive bond is damaged at the high temperatures. If the bond is disturbed before it has cooled, a further reduction in strength from that produced by the high temperature is observed. It is essential, then, that the adhesive be allowed to cool without disturbance after curing or after subjection to temperatures above the cure temperature in order to realize the strengths shown in Fig. 3.

Subjection of the cured bonds to low temperatures prior to testing at room temperature also decreased the shear strength, but the effect was not as great on the tensile strength (a cohesive property of the adhesive itself as shown by the mode of failure) as it was on the shear strength (a property of the adhesive bond).

Specimens tested at cryogenic temperatures without previous treatment exhibited a considerable decrease in shear strength at 76° K. compared to the room-temperature values, but there was no further decrease as the test temperature was lowered to 20° K. (Fig. 4, p. 173). The tensile strength of the specimens under the same test conditions is also shown in Fig. 4.

Thermal stress

If an adhesive bond is prestressed in some way by its thermal history, less of its native strength will be available to absorb service stresses before failure of the bond. Such thermal stresses may not be large when adhesive bonds are used at normal temperatures, but cryogenic adhesives often are subjected to several such stresses of considerable magnitude, the total effect of which is to impose serious



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limitations on the service strength. To illustrate the fact that this effect can be large, can in fact cause failure of the bond, some of the stresses that adhesives normally encounter in cryogenic use will be considered.

An adhesive bond to be used at, say, 20° K. will be prestressed at that temperature by 1) shrinkage of the adhesive during cure, and 2) the difference in thermal contraction between adhesive and adherend over the range from the cure temperature to 20° K. The first of these, cure shrinkage, is probably least among the rigid adhesives in the epoxy resins, and partially explains why a previous effort to find an adhesive suitable for cryogenic use disclosed the epoxy resins as the best performers. The work of de Bruyne (2) indicates, however, that this shrinkage is not negligible. Within the family of epoxies, shrinkage can be minimized by controlling the degree of cross-linking during cure and by adding fillers to the resin. But minimizing cure shrinkage would be desirable, of course, only if it did not involve a more serious compromise with other properties of the cured adhesive.

The second stress mentioned, that attributable to a difference in thermal contraction between adhesive and adherend, is present as a shear stress at the adhesive-adherend interface and as a tensile stress throughout the adhesive itself. In this regard, its effects are the same as those caused by cure shrinkage, but the inference is that a match in thermal expansion between adhesive and adherend would produce the strongest cryogenic bonds. Figure 5, p. 174, shows the measured expansion of unfilled and a particular filled epoxy compared with some of the cryogenic metals and with Pyrex glass. But amount and type of filler as well as particle size are known to affect the properties of the filled resin. For example, using glass-filled epoxies in an attempt to match the expansion of copper, we have recently made bonds which are even stronger at 76° K. than at room temperature. This is in spite of the fact that the presence of particles of a filler material of low expansivity reduces the expansion of the mixture at the expense of stresses induced in the resin component as it attempts to contract around a particle of filler. The net effect is to distribute thermal stresses throughout the adhesive instead of allowing them to concentrate at the adhesive-adherend interface.

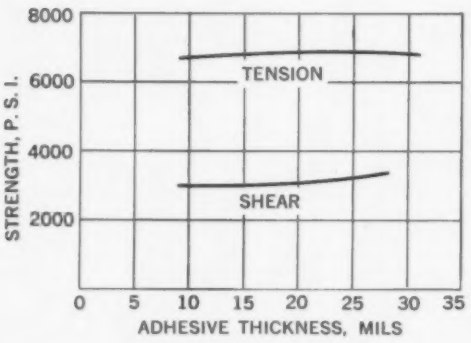


Fig. 6: Strength of a filled epoxy resin adhesive bond vs. thickness

Extending this observation to the range between cure and room temperature helps determine an optimum cure temperature. If the same degree of polymerization of a resin is effected by curing at two different temperatures, then the lower temperature should be chosen if maximum bond strength is desired. Choosing the cure temperature in this way minimizes the effect of a mismatch in adhesive and adherend expansions in cooling to ambient conditions from the cure. The polymerization of the resin and its resulting properties, however, are often quite sensitive to cure temperature, so that the lowest cure temperature may be chosen only when it does in no way involve a compromise with the properties of the adhesive itself.

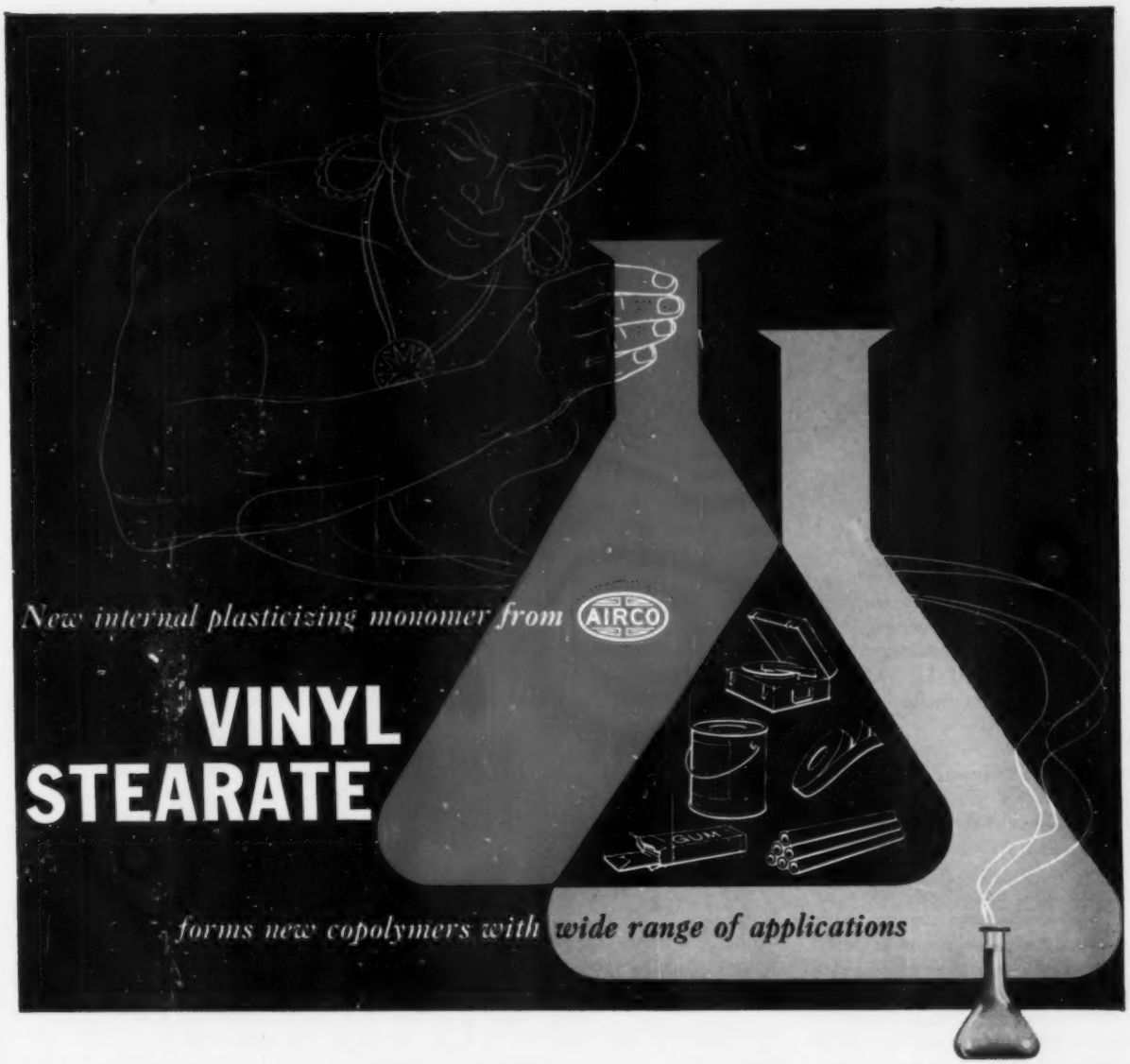
The above argument based on thermal stress is probably insufficient to account for the entire amount by which the observed shear strength is reduced at low temperatures. Neither does this argument account for the lower room temperature values observed after a thermal cycle to 76° K. It is not expected that any chemical or other irreversible changes are produced in the metal or adhesive by the temperature cycling, so the most logical explanation of these effects seems to lie in the consideration of the transient stresses produced by the cooling rate. Even if adhesive and adherend possess similar expansions between the temperature extremes, the adhesive will lag behind the metal in most changes of temperature because of its lower thermal conductivity and the contact resistance present at the interface. The stress produced in cooling and warming may thus be sufficient to cause local failures of the bond. Since the rate of temperature change was high in these tests as previously mentioned, this would explain the observed residual effect on shear strength as shown in Fig. 3.

Furthermore, since the adhesive has the greater expansivity, one would expect its temperature lag to help prevent such local failures in cooling. But in the warm-up process the opposite is true: the temperature lag of the adhesive serves to increase the transient thermal shear stress. A system bonded with an adhesive of different expansivity and thermal conductivity than the adherend, then, should be brought to temperature rather slowly in order to prevent thermal stresses from becoming high enough to cause local failures in the bond.

The residual effect on tensile strength may be caused in the same way, except that the reduction observed is due to local failures within the adhesive caused by the fact that the adhesive is a heterogeneous mixture of two components of different expansivity.

Some other remedies to the sit-

(*To page* 237)



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Plastics Digest

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Materials

New plastic stays strong at high temperature. Iron Age *181*, 112 (Mar. 20, 1958). A phenolic-asbestos plastic that is heat- and flame-resistant at 500° F. in continuous use is reported. It has a high modulus of elasticity, high mechanical strength, good insulation and thermal properties, high impact strength, low porosity, good dimensional stability, and can be fabricated by standard metal-working methods.

Polyox. High molecular weight polymers of ethylene oxide. Plastic properties. K. L. Smith and R. Van Cleve. Ind. Eng. Chem. *50*, 12-16 (Jan. 1958). Plastic properties of polymers can be interpreted primarily on the basis of high molecular weights and unusually high degree of crystallinity. These polymers have room temperature stiffnesses on the order of 50,000 p.s.i., extensibilities at break of about 700%, and brittle temperatures near —50° C., over the intrinsic viscosity range from 2 to 10. Cold drawing gives a highly oriented material, with a fivefold increase in tensile strength. Melt properties are characterized by pseudoplastic flow, 1000 fold increase in viscosity over the range of molecular weights examined, and susceptibility to permanent decrease in viscosity by shearing action. Melt viscosities are relatively insensitive to temperature. Resin moisture sorption is exceptionally low; physical properties are substantially unaffected by relative humidities up to about 90 percent.

Selection guide for sandwich-panel core materials. R. K. Humke. Product Eng. *29*, 70-75 (Jan. 20, 1958). The core materials used for sandwich construction are divided into three classes. The vegetable class includes materials such as plywood, paper honeycomb, and balsawood. The mineral group includes asbestos fiberboard and aluminum honeycomb. The foamed plastic class, precast or foamed-in-place types, are remaking the sandwich-panel industry because of simplification of manufacture and their range of useful properties. They have low thermal conductivity, good resistance to humidity and chemicals, and good dielectric properties. The greatest interest to date is in the precast foams based on polystyrene, cellulose acetate, epoxy, urea, and phenolic formulations. Specific advantages, limitations, and applications of these plastic components are given.

Molding and fabricating

Post-formed phenolic laminates. H. Storch. Product Eng. *29*, 66-68 (Feb. 17, 1958). Shaping parts from pre-laminated sheet stock can be used successfully in many applications with large savings. The economy results from less expensive dies, ease in alteration of dies for design changes, using interchangeable forming members in the die, and the heating equipment used, generally infra-red lamp ovens. The temperature range for post-forming is narrow and heat must be applied rapidly and uniformly, so that internal temperature reaches the optimum 325° F. in less than 1 sec. per 0.001 in. of thickness. Hardwood is a good die material but is unsuitable where dimensional stability and tolerances are critical. Plastics are often suitable. Information on the molding operation and final finishing are given in this discussion.

Offset printing of plastics products. H. Grauel. Kunststoffe *48*, 93-97 (Feb. 1958). Plastics products, especially packaging materials, can easily be printed by the offset process which has the advantage of being applicable to uneven surfaces, and lending itself to automation. The limits of its usefulness are determined by the properties of inks drying by oxidation, which are being increasingly used. The process and the machines, both single and multicolor, which have been developed for this purpose, are described. Printing inks, adhesion of the printing to the plastic surface, drying, and the possibility of a protective lacquer coat are also noted in the article.

Applications

Nylon-clad sleeve bearings. S. L. Penney and F. J. Bockhoff. Product. Eng. *29*, 52-54 (Mar. 3, 1958). The new polyamide, nylon-11, offers excellent possibilities as a covering for metal sleeve bearings. It has a bearing surface that will take high load, needs no lubrication, and can be produced at low cost. In addition, it has low moisture absorption and is useful in the temperature range of 212° F. to —67° F. For high-clearance sleeve bearings, fluidizing conditions can be controlled closely enough to give coatings that do not require subsequent machining, and that can take relatively heavy loads under both continuous and intermittent duty. Effectiveness as a bearing surface depends on the bond between the plastic film and the metal. Adhesion of nylon-11 to aluminum is aided by the oxide film on the metal, giving tensile adhesion up to 5000 p.s.i.

Properties

Fracture phenomena and molecular weight in polymethyl methacrylate. S. B. Newman and I. Wolock. J. Appl. Phys. *29*, 49-52 (Jan. 1958). Tensile specimens of cast polymethyl methacrylate of five different molecular weights varying from 90,000 to 3,160,000 were broken by static loading and

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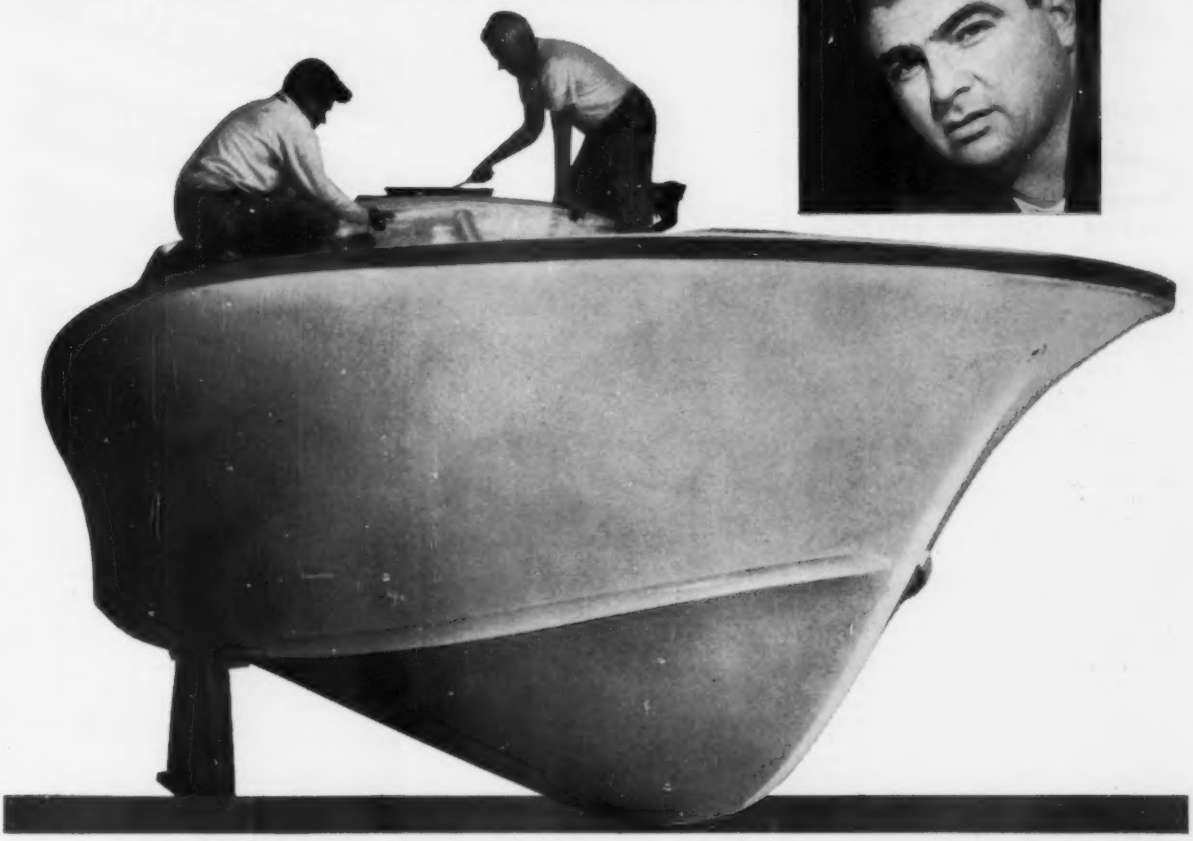

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the fracture surfaces compared. The fracture appearance was fairly constant for a given molecular weight but there was a continuous development of certain features and a retrogression of others with changes in molecular weight. The series which was developed by varying the molecular weight was similar in appearance to that developed by Zandman by varying the rate of loading of polymethyl methacrylate. The higher molecular weight specimens corresponded in appearance to those obtained at the lower rates of loading. In the higher molecular weights, failure by "separation" was most marked whereas fracture by "pulling out" of polymer masses became more important at the lower molecular weights.

Testing

Determination of lead in polyvinyl chloride compositions containing lead stabilizers. S. Grossman and J. Haslam. J. Appl. Chem. 7, 639-44 (Nov. 1957). The ultraviolet absorption of a lead chloride complex in hydrochloric acid solution is the basis for a rapid, quantitative method of analysis of lead which is present in polyvinyl chloride compositions utilizing lead stabilizers. The polyvinyl chloride is dissolved by refluxing in ethylene dichloride, and the lead is extracted with hydrochloric acid. A lead chloride complex is formed in a 50% solution of hydrochloric acid which has an absorption peak at 270 millimicrons. Optical density measurements at this wavelength may be used to determine concentration directly from a calibration chart.

Development of paper chromatographic techniques. A. D. Clarke and G. Bazill. Brit. Plastics *31*, 16-19 (Jan. 1958). The analytical techniques presented are applicable to the qualitative and, in some cases, quantitative identification of plasticizers found in polyvinyl chloride formulations. Specific attention is given to the five rather common types of plasticizers, including sebacates, azelates, adipates, phthalates, and benzoates. Soxhlet extraction using ether, followed by methanol, removes the plasticizer from

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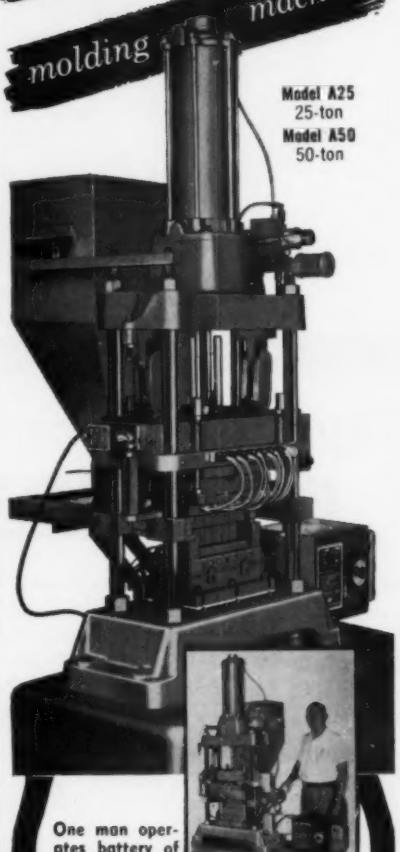

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Chemistry

Pilot plant development of a polyethylene process. M. R. Cines, G. H. Dale, E. W. Mellow, and R. E. Weis. Chem. Eng. Progress 54, 95-98 (Feb. 1958). The development of a pilot plant process for making polyethylene is outlined. Polymerization of ethylene occurs in a hydrocarbon solution in a stirred reactor with the aid of a suspended catalyst, chromium oxide on silica-alumina base. The catalyst is removed and polymer is recovered from the solvent, dried, and pelleted. Difficulties such as the plugging of process lines were eliminated by alterations of process steps. After the first year of pilot plant operation, process development reached the stage where information was available for design of most steps of the process and for a reasonable estimate of construction and operating costs. Further development into semiworks plant and commercial plant construction are briefly described with the material in this article.

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U. S. Plastics Patents

Copies of these patents are available from the U.S. Patent Office, Washington, D.C., at 25¢ each.

Condensates. A. Kreuchunas. U.S. 2,822,351, Feb. 4. Polysulfone condensation polymers.

Polymerization. C. A. Uraneck and R. J. Goertz (to Phillips Petroleum). U. S. 2,822,354, Feb. 4. Dihydrazenes in emulsion polymerization.

Polymerization. B. H. Werner (to Firestone). U. S. 2,822,355, Feb. 4. Stopping agent for vinyl chloride polymerization.

Polyethylene. D. L. Brebner, J. M. Bruce, Jr., and G. S. Stamatoff (to Du Pont). U. S. 2,822,357, Feb. 4. Polyethylene of controlled molecular weight.

Resin product. R. Imbert and P. DeVinzelles. U. S. 2,822,575, Feb. 11. Machine for producing continuous sections of cured thermosetting resin.

Molding. W. J. Schieser, J. F. Kelley, and D. G. Marshall (to Exact Weight Scale). U. S. 2,822,577, Feb. 11. Injection molding machine.

Molding. G. M. Lobell (to U. S.). U. S. 2,822,578, Feb. 11. Injection molding apparatus.

Leather coating. R. P. Hofferbert, J. P. Szumski, and W. L. D. McKay (to United Shoe). U. S. 2,823,157, Feb. 11. Coating leather with molten polyethylene.

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Resin. D. E. Floyd (to General Mills). U. S. 2,823,189, Feb. 11. Polyamide-epoxy resin product.

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Resin. J. P. Buckmann (to Union Oil). U. S. 2,823,193, Feb. 11. Polymers plasticized with fluid amides.

Polyamide. L. M. Shorr and M. P. David (to Dow Corning). U. S. 2,823,195, Feb. 11. Organosilicon polyamide compositions.

Thermoplastic. C. B. Havens (to Dow). U. S. 2,823,196, Feb. 11. Light-stabilized resins.

Polyesters. R. C. Morris, V. W. Buls, and G. W. Conklin (to Shell). U. S. 2,823,197, Feb. 11. Polyester compositions.

Resin. J. A. Ridgeway, Jr. (to American Oil). U. S. 2,823,198, Feb. 11. Polymerization in a hydrocarbon solution.

Copolymers. E. S. Lo (to M. W. Kellogg). U. S. 2,823,199, Feb. 11. Copolymers of acrylonitrile and 4,4-dichlorohexafluorobutene-1.

Polymers. R. M. Wheaton (to Dow). U. S. 2,823,201, Feb. 11. Halogenated polymers of nuclear methylated aromatic hydrocarbons.

Curing. W. G. Martin and D. J. Reed (To A. O. Smith). U. S. 2,823,415, Feb. 18. Apparatus for heat-curing resin articles.

Film. A. C. Scarlett (to Du Pont). U. S. 2,823,421, Feb. 18. Stretching polyethylene terephthalate film.

Seat covers. J. Brody. U. S. 2,823,736, Feb. 18. Breathers for plastic seat covers.

Coating. J. W. Gates, Jr. (to Eastman Kodak). U. S. 2,824,015, Feb. 18. Acylated polypeptide coatings.

Film. R. T. K. Cornwell (to American Viscose). U. S. 2,824,016-7-8, Feb. 18. Film-forming terephthalamide ester compositions.

Film. D. I. Sapper (to Du Pont). U. S. 2,824,019, Feb. 18. Polyethylene terephthalate film.

Film. T. F. Banigan (to Du Pont). U. S. 2,824,023-4-5, Feb. 18. Sizing films with polyvinyl acetate.

Pipe. C. Donaldson. U. S. 2,824,033, Feb. 18. Composite plastic pipe.

Copolymers. F. W. Lampe and H. G. Schutze (to Esso). U. S. 2,824,055, Feb. 18. Isobutylene-isoprene copolymer graft-polymerized with styrene.

Bearing compositions. H. S. White (to U. S.). U. S. 2,824,060, Feb. 18. Bearing compositions containing polytetrafluoroethylene and polytrifluorochloroethylene.

Cellular composition. M. F. Fuller (to Du Pont). U. S. 2,824,076, Feb. 18. Cellular polyvinyl chloride.

Polymerization. W. J. Priest (to Eastman Kodak). U. S. 2,824,077, Feb. 18. Polymerizing a prolamine and an acrylic acid.

Resin. C. Mellick (to Dearborn Chemical). U. S. 2,824,078, Feb. 18. Epoxy resin-amine pitch composition.

Polymer composition. W. F. Fisher (to Esso Research). U. S. 2,824,079, Feb. 18. Polyvinyl chloride composition.

Light inhibitors. E. H. Haux (to Pittsburgh Plate Glass). U. S. 2,824,080, Feb. 18. Hydroxy phenones as sunlight inhibitors for plastics.

Polyvinyl chloride. M. A. McCall and R. L. McConnell (to Eastman Kodak). U. S. 2,824,081, Feb. 18. Light stabilized polyvinyl chloride.

Polyepoxides. H. A. Newey (to Shell). U. S. 2,824,082, Feb. 18. Process for curing polyepoxides.

Curing agents. H. L. Parry and W. A. Hubbard (to Shell). U. S. 2,824,083, Feb. 18. Boron trifluoride curing agents for polyepoxides.

Polymers. C. C. Unruh and D. A. Smith (to Eastman Kodak). U. S. 2,824,084, Feb. 18. Light-sensitive unsaturated polymeric maleic and acrylic derivatives.

Resins. W. Cummings (to U. S. Rubber). U. S. 2,824,085, Feb. 18. Flame-resistant polyester resins.

Polymers. E. B. Towne, J. W. Wellman, and J. B. Dickey (to Eastman Kodak). U. S. 2,824,086, Feb. 18. Polymers of 3-amino-1,2,4-triazole with diisocyanates.

Resins. J. J. Sagura and C. C. Unruh (to Eastman Kodak). U. S. 2,824,087, Feb. 18. Light-sensitive rhodanine esters of maleic acid anhydride copolymers.

Electrodes. P. A. Marsal (to Carbide and Carbon). U. S. 2,824,165, Feb. 18. Electrodes comprising plastic matrices with electronegative and electropositive particles respectively.

Extrusion. A. F. Dellheim and L. F. Samler (to National Plastics). U. S. 2,824,781, Feb. 25. Forming and orienting polystyrene filaments.

Resins. M. E. Gilwood (to Pfaudler

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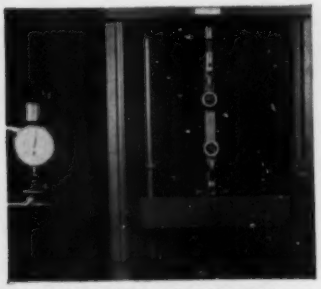

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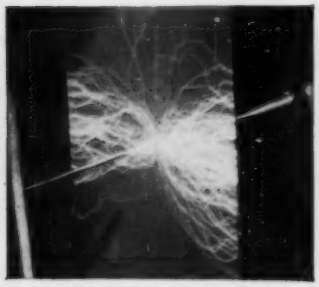

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Polymers. M. Kosmin (to Monsanto). U. S. 2,824,845, Feb. 25. Episulfide compounds and stabilized polymers containing same.

Polymers. I. O. Salyer, J. A. Herbig, and J. Dazzi (to Monsanto). U. S. 2,824,846, Feb. 25. Polystyrene.

Polymers. J. Fath (to Heyden Newport). U. S. 2,824,847, Feb. 25. Stabilized polyvinyl chloride.

Resin. J. F. Boiney (to Westinghouse). U. S. 2,824,849, Feb. 25. Dicyandiamide phenolaldehyde resin varnish.

Resin. G. Widmer and P. Zuppinger (to Ciba). U. S. 2,824,850, Feb. 25. Reaction product of a glycidyl ether and a hydroxy-containing compound.

Resins. M. W. Hall (to Minnesota Mining). U. S. 2,824,851, Feb. 25. Acrylic acid derivatives of epoxide resins.

Resins. R. J. Kern (to Monsanto). U. S. 2,824,852, Feb. 25. Cured mixture of polymeric 2-cyanoethyl acrylate and a cyano ether ester.

Resin. D. A. Gordon (to Dow). U. S. 2,824,853-4, Feb. 25. Thermoplastic bis(salicyloyl) benzene derivatives.

Resins. S. E. Freeman and G. W. Gottschalk (to Freeman Chemical). U. S. 2,824,855, Feb. 25. Epoxide resins.

Resins. S. Melamed (to Rohm & Haas). U. S. 2,824,858, Feb. 25. Polymers of polyethylenically unsaturated compounds.

Resins. E. V. Fasce (to Esso). U. S. 2,824,859, Feb. 25. Resins from maleic anhydride and steam-cracked fractions.

Resin. C. L. Aldridge and A. B. Small (to Esso). U. S. 2,824,860, Feb. 25. Hydrogenated petroleum resins.

Polymerization. R. I. Longley, Jr. and R. H. Martin, Jr. (to Monsanto). U. S. 2,824,862, Feb. 25. Suspension polymerization of vinyl halides.

Coupling. Anthony J. Barta and Robert T. Johnson (to Plymouth Industrial Products). U. S. 2,825,587, Mar. 4. Rigid thermoplastic duct joined by ball-and-spigot joint.

Sheet. E. E. Walker, M. P. Shaw, and V. W. F. Fisher (to British Celanese). U. S. 2,825,656, Mar. 4. Thermoplastic sheet.

Coating. L. P. Dosmann (to U. S. Rubber). U. S. 2,825,661, Mar. 4. Coating thermoplastic material.

Coating. J. R. Huntsberger (to Du Pont). U. S. 2,825,664, Mar. 4. Polytetrafluoroethylene coating.

Laminate. F. F. Koblitz and J. Tinoco (to Bjorksten Research). U. S. 2,825,672, Mar. 4. Improved plastic laminate.

Laminating. H. L. Wilson, S. B. Robison, and W. C. Smith (to Esso Research). U. S. 2,825,675, Mar. 4. Laminating, using tripolymer cements.

Polymers. H. R. Arnold, F. S. Fawcett, and W. W. Gilbert (to Du Pont). U. S. 2,825,704-5, Mar. 4. High molecular weight hydrocarbon polymers.

Coating composition. P. F. Sandors (to Du Pont). U. S. 2,825,706, Mar. 4. Polytetrafluoroethylene phenol-aldehyde coating.

Plastisol. R. J. Mayfield (to Du Pont). U. S. 2,825,711, Mar. 4. Plastisol compositions.

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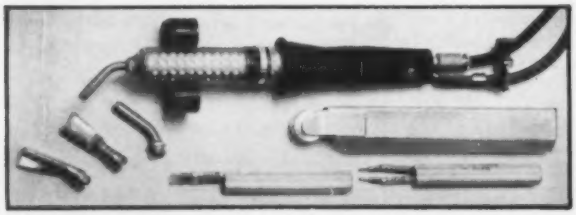

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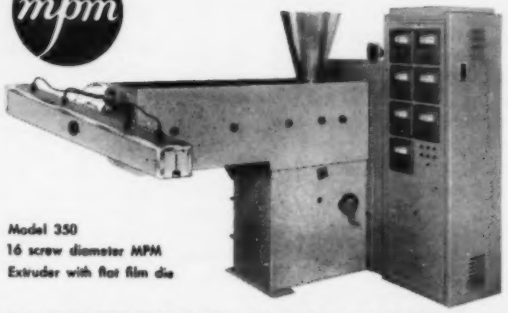

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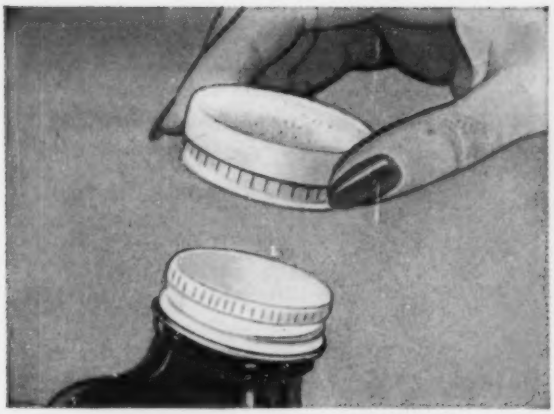

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By E. G. Fisher

Published in 1958 by Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. and Iliffe Sons, Dorset House, Stamford St., London, S.E. 1, England. 114 pages. Price: $3.50

This little book covers the subject well at a relatively elementary level. After a brief historical introduction, there are chapters on basic principles, theoretical considerations, for single-screw extruders, multi-screw machines, constructional features, extrusion compounds, and extrusion of thermosets. While author has made no use of published material of the last two or three years, the book provides a rounded introduction to the subject.—*J.F.C.*

"Industrial Chemicals" 2nd edition

By W. L. Faith, Donald B. Keyes, Ronald L. Clark

Published in 1957 by John Wiley & Sons, Inc., 440-4th Ave., New York 16, N. Y. 844 pages, 498 illustrations. Price: $16.00

Second edition of a comprehensive volume on production, use, and economics of 140 major industrial chemicals. Each chemical is treated individually in a separate chapter with information on how it is made and used, the amount produced each year for the past 20 years, price range, chemical and physical properties, various grades of each, who makes it and where, important economic trends. Production charts cover the years 1935 to 1955; price charts encompass the period from 1936 to 1956.

Blow molding equipment. Descriptive data on blow molding equipment which can be fitted to standard injection molding machines and adapted to both long and short run production. 6 pages. *The Granbull Tool Co., Ltd., 39 High St., Kingston-on-Thames, England.*

Packaging material. Description and in-use photographs showing Anchor Pak, a new corrugated interior packing material. 4 pages. *Hinde & Dauch, Sandusky, Ohio.*

Marking machines. Describes six basic and 16 special machines for marking and imprinting bottle caps, paint applicators, etc., made of plastics, wood, fabrics, etc. 4 pages. *Ackerman-Gould Co., 92 Bleecker St., New York 12, N. Y.*

Wood Flour Production Machinery. Descriptive data of production machinery required in making and handling of wood flour, a resin extender used in the plastics industry. Bulletin F-17. 4 pages. *Sprout, Waldron & Co., Inc., 130 Logan St., Muncy, Pa.*

Methyl acetoacetate. Technical data on methyl acetoacetate, a colorless liquid used in the manufacture of phenyl methyl pyrazolone for making acetoacetarylides as dyestuff intermediates, as a solvent for cellulose ethers and esters, and organic syntheses. 2 pages. *Aceto Chemical Co., Inc., 40-40 Lawrence St., Flushing 54, N. Y.*

Plastics fabricator. Facilities of company specializing in indoor and outdoor advertising displays, radomes, plotting boards, etc., all fabricated of plastics. 16 pages. *Universal Unlimited, Inc., Pratt Oval, Glen Cove, N. Y.*

Reinforced Molding Compounds. Selector chart, recommended molding conditions, storage and handling, die selection and design, price schedules, etc. for Atlac Thermaflow reinforced polyester molding compounds. 46 pages. *Atlas Powder Co., Chemicals Div., Wilmington 99, Del.*

Petrochemicals. Specification sheets for benzene, toluene, xylene 50, high aromatic solvents, and mineral spirits; includes description, specifications, typical analysis, etc. 9 pages. *Chemical Div., Delhi-Taylor Oil Corp., 415 Madison Ave., New York 17, N. Y.*

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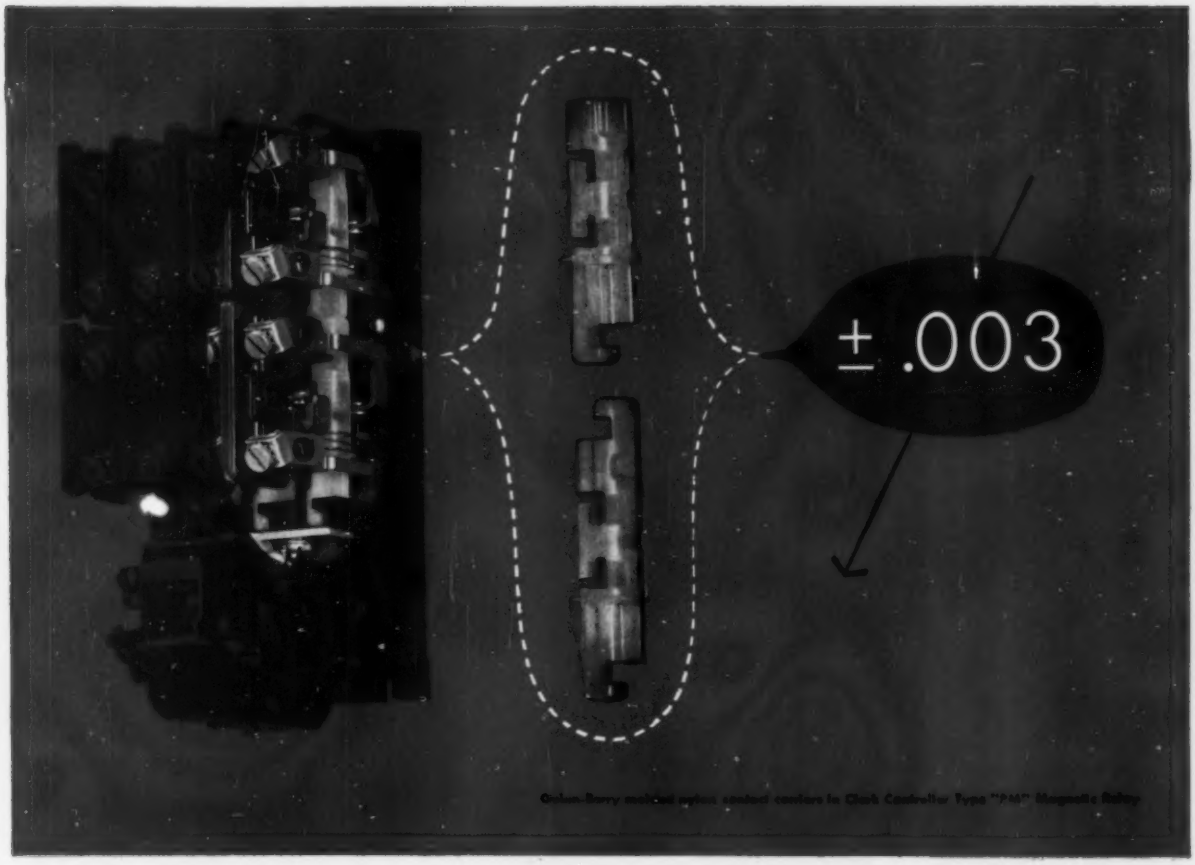
Pumps. Descriptive data on Triplex pumps for use with operation of hydraulic test equipment, molding presses, lubricating systems, etc. 12 pages. *Kobe, Inc., 3040 E. Slauson Ave., Huntington Park, Calif.*

Fasteners. Detailed specifications, engineering drawings, applications, and installation information on a line of plastics and other fasteners. Catalog 1257. 40 pages. *Simmons Fastener Corp., N. Broadway, Albany 1, N. Y.*

Molding machinery. Specifications, features, etc. for pre-plasticizing-type plastics injection molding machine. Bulletin 626-A. 6 pages. *Watson-Stillman Press Div., Farrel-Birmingham Co., Inc., 565 Blossom Rd., Rochester 10, N. Y.*

Molder. Outlines facilities and specializations, including electrical switchgear components, instrument housings, ground wood molding, etc. 8 pages. *Insulation Mfg. Co., 11 New York Ave., Brooklyn 16, N. Y.*

Coating resins. Current line of Plaskon coating resins for paints, varnishes, lacquers, and allied products. Includes description, performances characteristics, and test data dealing with modified alkyd coating resins, rosin, and phenolic-modified alkyds and



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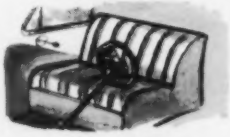

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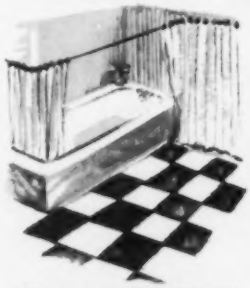

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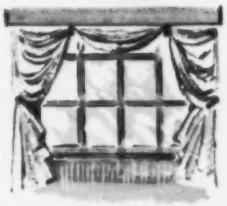

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Plastics machinery. Photographs and technical information on mills, refiners, calenders, presses, hydraulics units, vulcanizers, mixers and production equipment for the plastics and rubber industries. Catalog 58-L. 26 pages. *Stewart Bolling & Co., Inc., 3190 E. 65th St., Cleveland 27, Ohio.*

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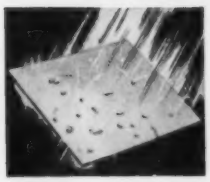

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KOHNSTAMM PIGMENTS IN EVERY SHADE FOR EVERY TYPE MATERIAL

Our colors are specially treated to eliminate dusting and aid in dispersability.

Whatever your need— basic chemical pigments, cadmium colors or specially formulated and treated colorant blends . . . we manufacture them all.

Our laboratory is available for consultation on any color problem.

H. KOHNSTAMM & COMPANY Inc.

Experts in Color Technology for More Than a Century

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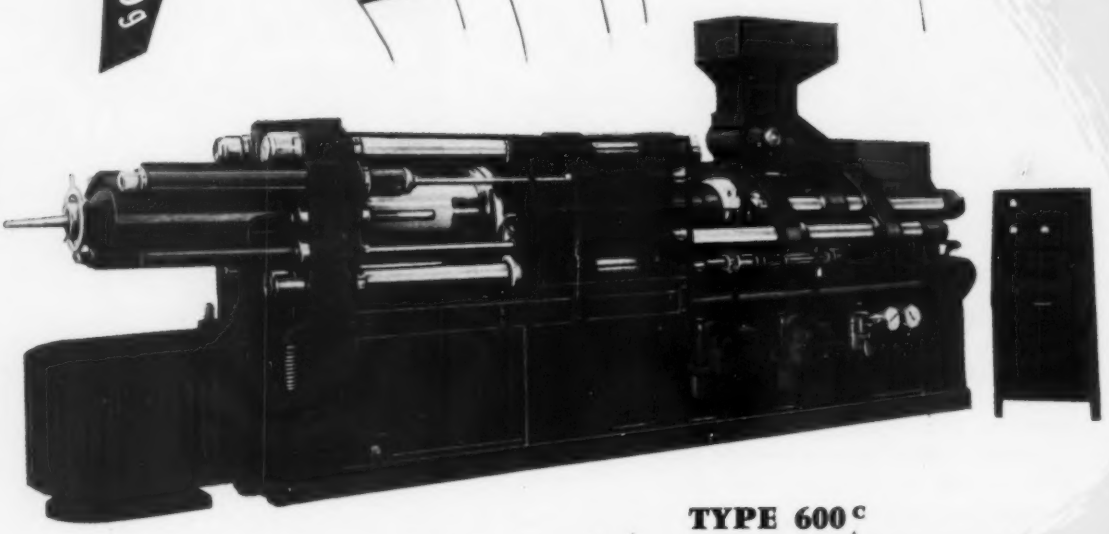
BRANCHES IN OTHER PRINCIPAL CITIES OF THE U.S.A. AND THROUGHOUT THE WORLD

Pour l'injection des matières plastiques...

FIMSAI

vous offre la gamme la plus complète de Presses à injecter



TYPE 600 C

autonome à cycle automatique ou automatique intégral

Concessionnaires exclusifs

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45, Rue d'Artois, PARIS 8e — Tél. : BAL. 21-49 (lignes groupées)

Documentation sur demande

Plastics problem got you down?

Get help in a hurry from your Encyclopedia Issue!

EXAMPLE: ***Where and how to use resins and molding compounds?***

1. See the section "Resins and Molding Compounds" for all the fundamentals. Also see the materials charts and supplier lists in the "Technical Data" section.
2. Then check the Advertisers' Index—on the first page of the "Resins . . ." section—for suppliers' ads on resins, coatings, emulsions, etc.
3. Secure additional names and addresses of suppliers from extensive Buyers' Directory lists in the back of the book.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. For more data, mail us the post cards in the enclosed Encyclopedia "How-to-use-it" Guide.

EXAMPLE: ***How to color plastics?***

1. See the section "Chemicals for Plastics" for complete background.
2. Next, refer to the Advertisers' Index on the first page of the section for ads relating to your specific needs.
3. Check the Buyers' Directory for a detailed listing of suppliers of dyes, stabilizers, plasticizers, etc.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. For further information, send us the post cards in the enclosed "How-to-use-it" Guide.

EXAMPLE: ***How to design a product—then get it made?***

1. Get the basic facts in the section "Engineering and Methods".
2. Then for molder and special service advertisements, see the Advertisers' Index on the section's first page.
3. Next, examine the Buyers' Directory for additional names and addresses of molders, extruders and service organizations.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. Send us the post cards in the enclosed "How-to-use-it" Guide for further information.

EXAMPLE: ***Which machinery to buy?***

1. Turn to the section "Machinery and Equipment" for a complete picture of the factors involved.
2. Then see the Advertisers' Index on the first page of this section and select ads whose messages bear on your problem.
3. Get further information—names and addresses of machinery, machine tool and equipment manufacturers—in the time-saving Buyers' Directory.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. Write for more information using the conveniently enclosed post cards in the "How-to-use-it" Guide.

The Encyclopedia is expressly designed to help you solve your problems. Reach for it next time you need help and see how valuable it can really be!

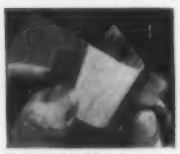
MODERN PLASTICS ENCYCLOPEDIA ISSUE

. . . for fast, accurate answers to plastics problems

do you have a
RELEASE PROBLEM
with rubber?
plastics?
film casting?
medical plasters?
pressure sensitive tape?

PATAPAR® RELEASING PARCHMENTS PEEL OFF EASILY, CLEANLY

Gives satin-like finish to corrugated polyester Fiberglas sheets



Release backing for pressure sensitive surfaces

Separator for rubber tape

Protective release backing for medical plasters

These special Patapars show excellent performance in many processes involving: *synthetic rubber, polyurethane foams, polyesters, vinyl, organic adhesives, organosols, phenolics, acrylics.*

Features of Patapar Releasing Parchments include dense, fiber-free texture – high resistance to penetration or migration of oil and softeners – inertness to any surfaces they contact–rigidity or flexibility as desired – easily printable.

Samples and technical assistance freely available. Write us on your business letterhead.

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HEADQUARTERS FOR VEGETABLE PARCHMENT SINCE 1885

recommendations for part and mold design and molding machine selection. 8 pages. *W. R. Grace & Co., Clifton, N. J.*

Paint applications. Technical data on Polyco 806, a vinyl acetate copolymer emulsion for use in full-gloss latex enamels, high-quality latex concrete floor paints, and low-cost latex flat wall paints. 18 pages. *Borden Chemical Co., Polyco-Monomer Dept., 350 Madison Ave., New York, N. Y.*

Tooling compounds. Aluminum-based tooling compound (112) for making thermally conductive molds for plastics and rubber; it is used in injection, compression, and vacuum molding. 4 pages. Tooling Compound 113 is steel-plastic-based for metal stamping and drawing, and performs like steel. It is said to eliminate mixing, weighing, and toxicity associated with conventional tooling materials. 4 pages. *Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.*

Insulating material. Technical information on Vulcoid, an intermediate insulation material made of resin impregnated vulcanized fibre for use in electrical and bearing applications. Bulletin V-58. 4 pages. *Continental-Diamond Fibre Corp., Newark, Del.*

Destaticizers. Technical data on Electrosols A and B for the destaticization of plastics. 2 pages. Similar data for Electrosol 400, for use in dyeing synthetic fibers, threads, or fabrics, 3 pages. *Alframine Corp., 72-76 Putnam St., Paterson 4, N. J.*

Bronze powder. Product bulletin describing nine bronze powders and pastes for PVC, polystyrene, epoxy, nylon, and polyethylene. 1 page. *Hummel Chemical Co., Inc., 90 West St., New York 6, N. Y.*

Vacuum Impregnation Equipment. Descriptive data on high-vacuum drying, degassing, impregnating, and filling equipment for the plastics industry. Bulletin 1-2. 26 pages. *NRC Equipment Corp., 160 Charlemont St., Newton Highlands 61, Mass.*

Nacromer®

makes any plastic look better... sell better

The visual impression your product makes is half the sale! And, Nacromer, the synthetic pearl concentrate, will give your product the appeal that increases sales. Here's how:

POLYETHYLENE

Nacromer completely overcomes the waxy, dull finish of polyethylene, providing a high gloss and transparency impossible to achieve any other way.

POLYSTYRENE

Nacromer endows this plastic with unequalled richness by creating a high pearly lustre of exceptional depth.

VINYL

Incorporated into this resin, Nacromer gives a smooth pearlized finish. Coated on embossed patterns, Nacromer adds sparkle.

ACRYLICS

Nacromer lends itself to pearlized patterns, swirls, and other unique effects in cast sheets and rods. In molded acrylics, it adds a distinctive pearly lustre.

ACETATE, CASEIN

Nacromer makes any plastic look better.

Compounded directly into the plastic, or applied as a surface coating, Nacromer adds eye-appeal. See the difference it can make in your product. Write today for complete details... please mention the plastic used.

the Mearl corporation

"World's Largest Producers of Pearl Essence"

124 East 40th Street, New York 16, N. Y.

Fibercore

MOLDING COMPOUNDS

PROVIDE	High impact strength Low specific gravity Excellent chemical resistance Superior electrical properties Dimensional stability Smooth surface finish
PERMIT	Complex part design Use of metal inserts Unrestricted use of colors

Fibercore Molding Compounds are high impact fiber-glass reinforced polyester molding materials. They are available in Standard Chemical, Electrical, and Flame Resistant-Electrical grades and all colors. They can also be specially formulated to meet specific application requirements.

Brochure and technical data reports available upon request. Write to:

PLUMB. CHEMICAL CORPORATION

4837 JAMES STREET · PHILADELPHIA 37, PA.

New Machinery and Equipment*

Automatic injection machines

The Formaton-J models are fully automatic machines in the 1.5- and 2-oz. classes. Very compact (they require a floor space of only 28 by 66 in.), they feature overhanging mold clamps that permit the product to be conveniently collected in drums or conveyed away. The injection cylinder, of stainless steel, is built into the clamp ram. Molds up to 1 ft. sq. can be clamped. A self-adjusting feed compensator balances intake to output. Complete specifications are listed below. *Guy P. Harvey & Son Corp., Leominster, Mass.*

Guy P. Harvey Formaton-J injection machines have overhanging mold clamps for collecting and conveying of moldings

Heat sealer for long seals

The Model PG-58 electronic heat sealer has been especially designed to make long seals like those in rainwear, pool liners, etc. To overcome the long-standing problem of equalizing pressure over the whole length of seal, a new leveling mechanism has been developed. The new sealer is available in two- and four-post models, with tables up to 96 in. long, and generators up to 10 kilowatts. *Sealomatic Electronics Corp., 429 Kent Ave., Brooklyn, N. Y.*

Two-range surface pyrometer

Claimed to be the first of its kind, the Pyro Model DR35 surface pyrometer has two measuring ranges, with appropriate scales, from 0 to 500° F. and 0 to 1500° F. Selection of range also changes room temperature compensator. Low range is marked off in 5° subdivisions; high range divisions are 20° F. Accuracy is 1.5% of maximum scale reading, on both ranges. *The Pyrometer Instrument Co., Inc., 94 Portland Ave., Bergenfield, N. J.*

Marking machine

The Model 45H marker uses a hot marking head and a printing compound that is not a liquid until it has been softened by the head. The marked object dries instantly as the compound freezes; hence the name "Touchdry" for the compounds. The user has no problem of drying out of the compound during the day's operation as is common with compounds that dry by solvent evaporation or absorption. Ink can't be spilled. Imprint areas up to 6.56 by 2.44 in. are possible using plates, type bars, or rubber plates. *Markem Machine Co., Keene 49, N. H.*

Diameter gage

An electronic instrument that detects changes in diameter of round stock and coated wire operates by picking up changes in the shadow cast by the passing round stock. The gage is accurate to within 2 mils, and is intended for control of diameters 3/8 in. and above. Gage signal is displayed on a meter, recorded on a strip chart, and may be used to control operating variables. Since no part of the instrument touches the product, it will measure diameter of wire coatings, etc., that are still in the molten state. It would seem that this instrument could also be used in measuring critical dimen-

Specifications for Formaton—J

Specifications	*J-1½ st'd*	*J-1½ hi-speed*	*J-2 st'd*
Capacity:			
Ounces/cycle (styrene pellets)	1½	1½	2
Plasticizing capacity, lb./hr.	40	40	50
Performance:			
Full capacity, cycles/hr., max.	460	690	552
½ capacity, cycles/hr., max.	800	1200	960
Injection unit:			
Pressure on material, p.s.i.	20,000	20,000	20,000
Plunger speed forward, in./min.	320	400	350
Clamp unit:			
Locking tons	37½	37½	50
Mold depth, in.	5-15	5-15	5-15
Mold size (between rods), in.	12x12	12x12	12x12
Discharge unit:	Air	Air	Air
Hydraulic system:			
High volume, p.s.i.	300	300	300
High pressure, p.s.i.	1500	1500	2000
Total delivery, gal./min.	24	40	38
Electrical system:			
Heating cylinder, kw.	2.7	2.7	3.4
Motor, h.p.	5	7½	7½

*Specifications and claims made and appearing in these pages are those of the manufacturers of the machinery and equipment described and are not guaranteed by MODERN PLASTICS.

Milan Krajcik, Plastics Superintendent of *Rubbermaid* Incorporated says:

"We get round-the-clock automation with VAN DORN presses"

These Van Dorn presses have produced millions of flexible Vinyl feet for Rubbermaid dish drainer baskets in the last two years. The operation is *fully automatic,* with presses running 3 shifts on a continuous basis.

Rubbermaid uses multi-cavity, tunnel gate molds, and the original molds are still in use. On the infrequent occasions when the job needs attention, the operator of a large machine nearby can readily come over between cycles of his own press.

You, too, can save time and money with Van Dorn automatic, 2½ oz., high production injection presses. Write for detailed literature.

THE Van Dorn IRON WORKS CO.
2685 EAST 79th STREET · CLEVELAND 4, OHIO

sions of certain non-round extrudates. *Industrial Gauges Corp., West Englewood, N. J.*

Processing aids

Slip-eze, Vyn-eze, and Stat-eze should help extruders and molders with problems of blocking and static charge accumulation. Slip-eze is intended to be compounded into polyethylene by the resin supplier, but may be added by the extruder or molder by a dry-blending procedure. It is said to prevent static, tackiness, and blocking. Vyn-eze is a similar product for vinyl compounders. Stat-eze is intended primarily for the textile trade, but will also render moldings anti-static. *Fine Organics, Inc., 211 E. 19th St., New York 3, N. Y.*

Shell assembler

The Matchmaker automatically assembles half shells of various plastics to form hollow figures, balls, etc. The heart of the machine is a chain-driven endless conveyor, the links of which carry pairs of nests. These, though designed to locate the pieces in an exact way, have a controlled amount of "give" that permits the various matching projections to snap together in spite of slight irregularities and warpage. The operator inserts the pieces into the open nests. A controlled amount of cement is then automatically applied to the mating surfaces, the two halves are closed, and they remain clamped together for the rest of the circuit. Finished pieces are automatically ejected as they return to the operator. Outputs range up to 30 pieces per min., which is about three times the manual rate. The nests are inexpensive and easily interchanged to accommodate a variety of products. *Automation Design & Machy. Co., Inc., 532 E. 178 St., New York 57, N. Y.*

Preheater and drier

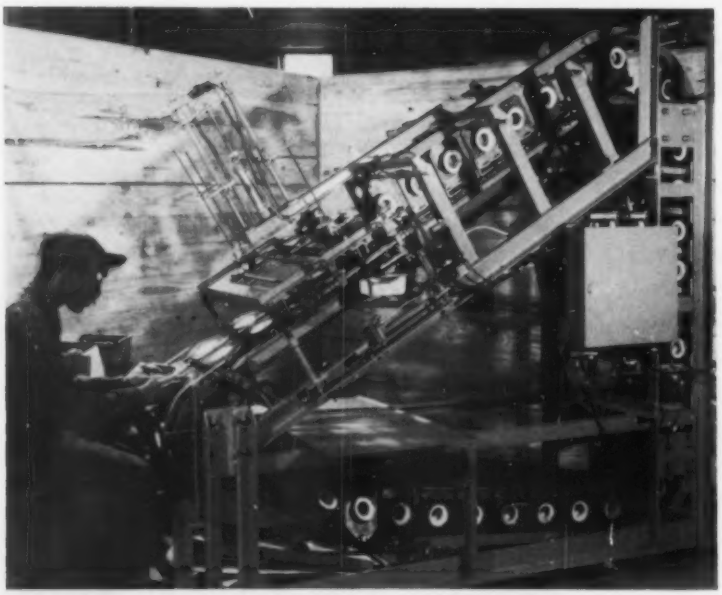
A portable hopper dryer has a capacity of 5 cu. ft. and can supply dried molding powder to injection machines up to the 12-oz. size. A built-in humidity controller makes the dryer useful for nylon processing. This device loads through a large covered opening in the top, discharges from a gate valve at the bottom, and requires no compressed air or chemicals. Sight glass shows level of powder inside. Larger units are available. *Thermomat Co., 300 Maple Ave., Trenton 8, N. J.*

Pumps for vacuum forming

Two new vacuum pumps with self-contained cooling units are said to eliminate the problems of pump overheating and pump "freezing" when drawing vacuum on hot plastics sheets. Circulating oil cools the pumps, and the oil in turn is air-cooled by fan or radiator. Fan-cooled models (three) range in capacity from 2.4 to 12.4 cu. ft./min., while the two larger, radiator-cooled pumps have capacities of 15.3 and 40.8 cu. ft./min. Pump temperature is kept down to 170° F. in continuous operation by this cooling system, which requires no water. At this temperature, oil life is good, there is little vaporization of oil, and its lubricating properties are maintained. *Leiman Bros., Inc., 102 Christie St., Newark 5 N. J.*

Two-color injection machines

An Italian maker offers a small injection machine designed to do away with the costly transfer of two-color moldings between shots. (Business machine key tabs are probably the most important use for this type of molding today.) The machine consists mainly of a clamping system with an apparatus rotating about it on a crankshaft. The molds are successively set in five different positions, in two of which the molding of the two colors is carried out; trimming and ejection operations are done in the others. About 3000 pieces an hour can be turned out in this machine. *A Triulzi S.A.S., Via G. Procida 8, Milan, Italy.*



Automatic Design and Machinery Matchmaker permits assembly of plastics shells to form hollow figures

Hopper dryer

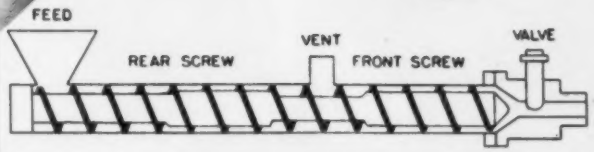
The B & J heater-dryer can be attached to the hopper of an injection or extrusion machine. It consists of a heating unit with filter and blower, and a flexible hose that delivers the warm, clean air to a heat spreader in the hopper. Air temperatures up to 235° F. are possible. Maintenance is simplified because all parts are exposed upon release of two fast latch-locks; and the filters are washable. Five models are available for capacities ranging from 75 to 1200 lb./hr. *Ball & Jewell, Inc., 24 Franklin St., Brooklyn 22, N. Y.*

Table model thermoformer

The Test-Vac 81 weighs only 35 lb., has a forming area of 9 by 9 in., and can draw to a depth of 4 inches. Clamping frame adjusts

PRODEX

THE PRODEX EXTRUDER WITH VENT AND VALVE ...SO EASY TO OPERATE



The combination of a TWO-STAGE extrusion screw with VENT and VALVE gives these advantages:

* **HIGH OUTPUT.** The rear screw determines the high output rate of this machine because it is not subjected to die back pressure. Easy valve adjustment permits the same output rate (lbs./hour) for a wide range of die openings.
* **CLOSE TOLERANCES.** Since the front screw is fed a hot melt of uniform viscosity, a constant pumping pressure is easily maintained by valving, resulting in close tolerances.
* **NO POROSITY.** Venting with or without vacuum continuously extracts air, moisture, monomer and other volatiles. High volatile content can be readily removed.
* **BETTER DISPERSION.** Two stage extrusion with intermediate relaxation and reorientation provides high intensity mixing. Valving permits controlled mixing in front screw.
* **DRY COLORING.** Dry colored compounds are directly extruded into shapes and sheets on PRODEX vented extruders.

PRODEX Vented Extruders are used successfully in sheet and shape extrusion of H.I. Styrene, ABS polymers and methyl-methacrylate without pre-drying; wire and cable coating and shape extrusion from vinyl dryblend as well as in a wide variety of process applications where monomer, solvents or moisture must be removed in large quantities.

No matter what thermoplastic material you now use, the PRODEX extruder will help you get better results. Arrange for a production-line demonstration today with your material.

50 PAGE ILLUSTRATED BULLETIN E-3 gives complete details about PRODEX EXTRUDERS.

Package installations for sheet, film, pipe, wire and cable, continuous compounding and laminating. PRODEX extruders are available in 1¾", 2½", 3½", 4½", 6" and 8" sizes.

PRODEX CORPORATION

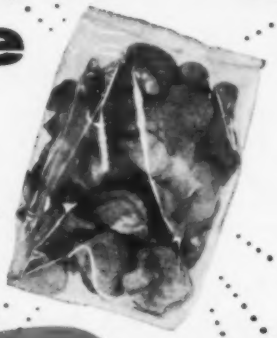
FORDS, NEW JERSEY · Hillcrest 2-2800

Manufacturers of Process and Extrusion Machinery

IN CANADA: Barnett J. Danson & Associates, Ltd., 1912 Avenue Road, Toronto 12, Canada

PRODEX

Where
moisture
control
is critical . . .



use protective GREX*
HIGH DENSITY POLYETHYLENE

Where moisture must be sealed *out*—sealed away from crisp, flavorful potato chips—or sealed *in*—as with moist, succulent foods that can be boiled in the package if you wish—film made of GREX brings a totally new standard of performance to the job.

The secret is its great resistance to moisture transmission. GREX provides a tight, tough barrier . . . keeps moisture from seeping in *or* out.

In thin gauges, film made of GREX is an economical, highly effective food package. Heat-sealed as an "envelope" it has excellent moisture and gas barrier properties . . . clear, attractive and rip-resistant.

In heavier gauges, GREX film is a sturdy, re-usable cover for construction projects . . . for example, as a moisture barrier for slow curing wet concrete. It has many valuable uses in agriculture as well—*wherever moisture control is critical.*

For packaging . . . in construction and agriculture . . . for industrial coatings . . . *this versatile plastic means better products for you.*

*Trademark for W. R. Grace & Co.'s polyethylene

W. R. GRACE & CO.
POLYMER CHEMICALS Division
OFFICES: CLIFTON, N. J., CHICAGO, ILL.
PLANT: BATON ROUGE, LA.

Plast-O-Craft table model thermoformer machine has forming area of 9 by 9 in., can draw to depth of 4 inches

to permit either drape or vacuum forming. This machine was created specifically for package designers, model and mold makers, development workers in packaging, etc. Heat is furnished by bare Nichrome coils, vacuum is drawn by hand. Maker also offers sheets of various materials cut to size for this machine. *Plast-O-Craft Co., Inc., P. O. Box 62, Boonton, N. J.*

Automatic plastics welders

The Redimat semi-automatic and automatic welding machines use specially shaped welding rod to do in one pass jobs that may require several passes with the usual hot - gas hand - welding method. Makers claim several other advantages: welding time is reduced to 1/10 of hand-welding time; strength of weld is better by up to 30%; no special skill is required; smooth, homogeneous welds are obtained; and there is less danger of distortion of piece due to overheating. The fully automatic machine is adapted to welding long straight seams, while the semi-automatic machine can be used for a variety of shapes. Both require air at about 10 p.s.i., consume 750 w., and heat the air stream to about 575° F. *Rediweld, Ltd., Kelvin Way, Crawley, Sussex, England.*

Extrusion plastometer

This instrument is essentially a ruggedized melt indexer provided with weights up to 21.6 kg., 10 times the top load of the original. The weight rests on a piston that in turn presses on a sample of polymer. The sample, whose tem-

perature is controlled by preset heaters, is squeezed through a small orifice and the rate of extrusion is measured by weighing the extrudate collected over a fixed time interval. The instrument is said to meet the requirements of A.S.T.M. test D1238-52T. *Tinius Olsen Testing Machine Co., 7905 Easton Rd., Willow Grove, Pa.*

Barrel finishers

Fifteen models of barrel finishing machines with capacities that range from 5 to 25 cu. ft., designated as the 30 Series, feature oversize, variable-speed V-belt drives and a new cylinder-sealing method that insures leakproof operation. Safety features include positive jogging that allows operator to inch cylinder forward or back for loading, a front closure that stops machine if raised, fused controls, pressure release valve, totally enclosed drive. Motors run at 1800 r.p.m., range in power from 1 to 5 hp., according to machine size. *Crandall Engineering & Mfg., Inc., P. O. Box 291, Vicksburg, Mich.*

Floor-level-loading tumbler

A double drum tumbler capable of handling drums up to the 55-gal. size has been designed so that it is loaded and unloaded at floor level with the drums in the convenient vertical position. This eliminates manual lifting of heavy drums. The machine is equipped with built-in drum extenders—hollow caps that provide free space for mixing at the tops of full drums. Fast-action toggle clamps speed loading and unloading. Tumbling speed is 30 r.p.m. *U. S. Stoneware Co., 5300 E. Tallmadge Ave., Akron 9, Ohio.*

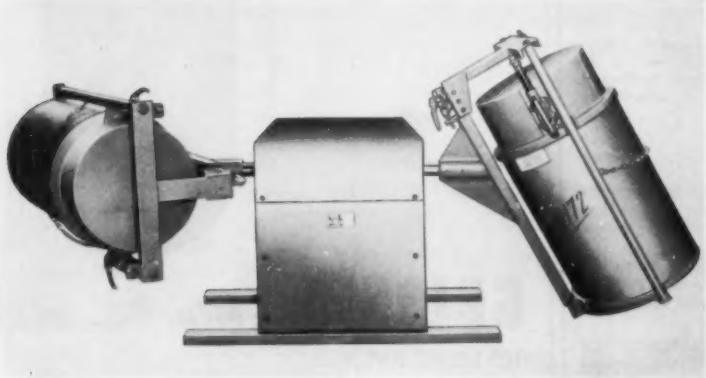
High-pressure valves

A new line of valves for hydraulic oil systems includes six basic models which differ in their method of actuation. Mounting dimensions are the same for all. These directional control valves are useful at pressures up to 3000 p.s.i. (tested at 4500), have high-tensile alloy bodies, hardened and ground spools, and are fitted with dry-seal pipe threads. Two sizes are available: ½ in. for 12 gal./min., and ¾ in. for 18 gal./min. Most of these models can be had with a choice of four different spool actions, with and without springs. *The Dukes Co., Inc., 3999 N. 25th Ave., Schiller Park, Ill.*

Cartridge heaters

The CS stainless-steel-sheath cartridge heaters are intended for heating of dies, etc., where concentrated heat is needed and space is scarce. Lead wires are nickel alloy covered with fibrous glass, or screw-type terminals. Available in a range of wattages in either 115- or 230-v designs. *C & S Products Co., 18656 Fitzpatrick Ave., Detroit 28, Mich.*

The Howatt cartridge heater line now has a new member—the ¼-in.-diameter units. They are available in lengths from 1 in. up. Standard wattage ratings are based on 50 w./sq. in.; higher-density units can be made up. Sheaths are stainless steel, offer-

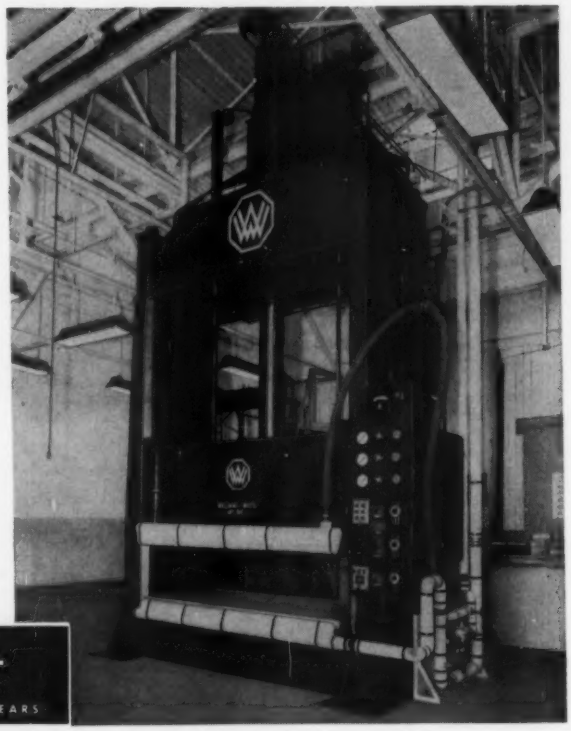


U. S. Stoneware two-drum tumbler can be loaded and unloaded at floor level, has built-in drum extenders

SEND NOW FOR
FREE SAMPLE
MAIL COUPON NOW! GET 20 OZ. CAN FREE! Just write your name and address
PRICE DRISCOLL CORP.
350A Sunrise Highway
Rockville Centre, N. Y.
Please send me FREE SAMPLE OF BOMB-LUBE.
Name
Address
City Zone State

PROVE YOU GET BEST RESULTS FOR LESS MONEY with SUPER KING
BOMB-LUBE
Pure silicone mold release with exclusive formula PLUS X that reduces flow-friction, prevents sticking, eliminates residues!
PUT BOMB-LUBE TO THE ACTION TEST
See how this amazing pure silicone lubricant gets in there, everywhere, hits every cavity! Best for even the longest runs. Giant 20-oz. can holds 66⅔ MORE than others; BOMB-LUBE saves hours in the pressroom, reduces labor time; cuts down risk because BOMB-LUBE IS NON-TOXIC, NON-INFLAMMABLE, NON-EXPLOSIVE.
*brings down cost of each application to only ½¢
*hundreds of applications in every can
Don't pay extra for a costly metal valve you throw away...
GET FREE RE-USABLE SPRAY-CAN HANDLE WITH EVERY 12 CANS OF BOMB-LUBE
Bomb-Lube
$2.50 single can
$1.90 12 to 47 cans
$1.75 48 or more cans FOB PLANT
PRICE DRISCOLL CORP.
350A Sunrise Highway, Rockville Centre, N. Y.

WILLIAMS-WHITE PLASTIC MOLDING PRESSES



The versatility of WILLIAMS-WHITE design and construction is well represented in the 200 Ton Hydraulic Press as shown, installed in one of the nation's leading aircraft plants.

The press was purchased for such diversified operations as fibre-glass molding, metal bonding, production of honeycomb sections and other compression molding operations. The accuracy and selectivity of control permits the press to be used in either production or laboratory projects.

Steel plates, heated by steam and cooled by water, are mounted on the face of the table and slide.

REPRESENTATIVES

CALIFORNIA, Los Angeles: George A. Davies Machinery Co.
MISSOURI, St. Louis or Kansas City: Robt. R. Stephens Machinery Co.
OHIO, Cincinnati: Columbus or Dayton: Seifreat-Elstad Machinery Co.
OREGON, Portland: Allied Northwest Machine Tool Corp.
Wynnewood (Phila.): Edw. A. Lynch Machinery Co.
PENNSYLVANIA, Pittsburgh: Frank Ryman's Sons
WASHINGTON, Seattle: Perine Machinery and Supply Co.
WISCONSIN, Milwaukee: Pagel Machinery Co.

BUILDERS OF MACHINERY SINCE 1854

WILLIAMS-WHITE & Co.
300 EIGHTH ST. • MOLINE, ILLINOIS
PRESSES • BULLDOZERS • BENDERS • PUNCHES • SHEARS

ZYTEL is the new tradename for Du Pont nylon resin.

SINKO MOLDED Cabinet Rollers

The Cabinet Drawer Rollers pictured were molded of Sinko ZYTEL for a leading manufacturer of fine Kitchen Equipment. This long-wearing plastic material was selected after a series of exhaustive tests had proven its superiority over many others.

Moving parts made of ZYTEL are quiet in operation even after long exposure to continued wear.

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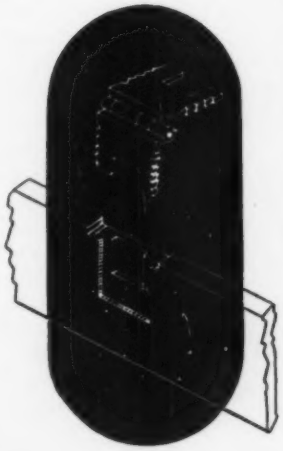

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109 LONG AVENUE
HILLSIDE, N. J., U. S. A.

ing surface temperatures up to 1250° F., with nickel alloy leads. Any desired voltage. *Hotwatt, Inc., 16 Gould St., Danvers, Mass.*

Mold release

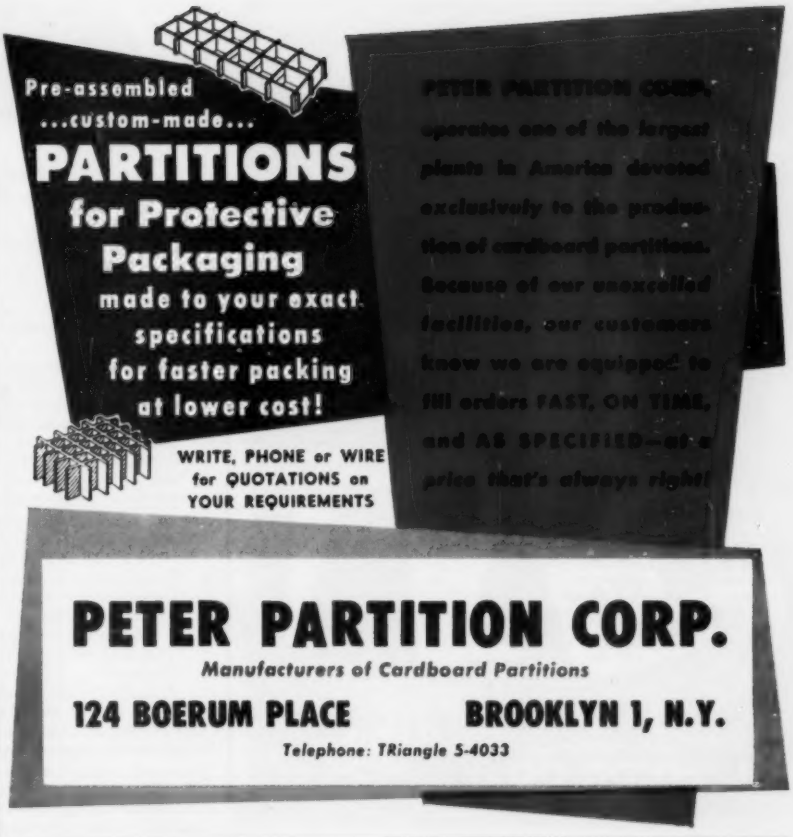
Ram Mold Release 225 is now available in aerosol containers. The material is a heat-stable, non-carbonizing parting agent of low surface tension [probably a silicone or mixture of same] in a solvent carrier. It is especially useful in releasing epoxies, acrylics, polyesters, phenolics, and silicone molding materials. It is reported that Ram 225 provides release for many cycles with one application and does not discolor. There is little or no transfer to the molded parts since the material dries rapidly on warm surfaces. *Ram Chemicals, Inc., 201 E. Olive St., Gardena, Calif.*

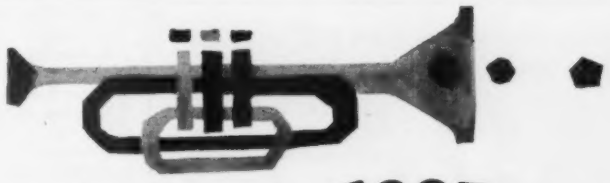
Small universal tester

A strength testing machine of 300-lb. capacity can make tests in tension, compression, bending, or shear, on plastics, threads, fabrics, films, etc. Operating principle is calibrated pendulum, with an accuracy of 0.5 per cent. Automatic stress-strain recorder plots curve at draw rates up to 20 in./min. Grip clearance is 14.8 in. in standard model, up to 36 in. in special models. Meets applicable Federal and ASTM specifications. *W. C. Dillon & Co., 14620 Keswick St., Van Nuys, Calif.*

150-ton compression press

The Bradley & Turton Model 536U/1 press "has been designed to offer as wide a range of characteristics as possible." Stroke is downward at a top rate of 6 in./sec. The press may be operated by hand or automatically, and it has an upstroking transfer or ejection cylinder. Closing ram stroke may be anything from 6 to 15 in., daylight is 30 in. maximum, platen area is 20 by 20 in., transfer/ejector ram stroke is up to 6 inches. Considerable versatility in ejection is built in. A six-element timer permits almost any desired sequence of operations in an automatic cycle. Made in England. Distributed and serviced in the U. S. by *Wilmod Co., Plastics Div., 2488 Dufferin St., Toronto, Ont., Canada.*—END





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Materials
Cellulose plastics:[a]
Cellulose acetate and mixed ester:
Sheet, under 0.003 gage
Sheet, 0.003 gage and over
All other sheets, rods, tubes
Molding, extrusion materials
Nitrocellulose sheets, rods, tubes
Other cellulose plastics
Phenolic and other tar-acid resins:
Molding Materials[a]
Bonding and adhesive resins for:
Laminating (except plywood)
Coated and bonded abrasives
Friction materials (brake linings, clutch facings, and similar materials)
Thermal insulation
Plywood
All other bonding uses‡
Protective-coating resins
Resins for all other uses
Urea and melamine resins:
Textile-treating resins
Paper-treating resins
Bonding and adhesive resins for:
Plywood
All other bonding and adhesive uses, including laminating
Protective-coating resins
Resins for all other uses, including molding
Styrene Resins:
Molding materials[a]
Protective-coating resins
Resins for all other uses
Vinyl resins, total[b]
Polyvinyl chloride and copolymer resins (50% or more polyvinyl chloride) for:
Film (resin content)
Sheeting (resin content)
Molding and extrusion (resin content)
Textile and paper treating and coating (resin content)
Flooring (resin content)
Protective coatings (resin content)
All other uses (resin content)
All other vinyl resins for:
Adhesives (resin content)
All other uses (resin content)
Coumarone-indene and petroleum polymer resins
Polyester resins:
For reinforced plastics
For all other uses
Polyethylene resins:
For film
For all other uses
Miscellaneous:
Molding materials[a,d]
Protective-coating resins[e]
Resins for all other uses[f]

*Dry basis designated unless otherwise specified. †Revised. ‡Partially estimated. §Includes friction materials. [a]Includes fillers, plasticizers, and extenders. [b]Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production

Production

From statistics compiled by the U. S. Tariff Commission

January†		February‡	
Production	*Sales*	*Production*	*Sales*
1,289	1,214	1,230	1,225
1,499	1,199	1,471	1,282
777	557	582	662
6,138	6,433	6,677	6,427
348	376	290	291
874	693	671	432
15,723	13,087	13,213	11,799
4,989	3,197	4,946	3,198
1,360	916	973	889
1,306	969	1,016	1,006
4,346	3,686	3,276	3,037
4,069	3,547	3,581	2,628
4,029	3,627	3,060	3,099
2,292	2,092	2,369	1,708
2,991	2,115	2,434	1,666
3,177	3,032	2,855	2,863
2,413	1,800	2,242	1,708
7,664	6,988	6,247	6,611
3,425	2,720	2,853	3,348
2,616	1,926	2,091	1,696
8,951	8,915	7,674	7,100
28,550	33,084	29,656	33,428
7,690	7,233	7,497	6,773
13,151	10,685	12,560	9,969
68,977	58,897	58,327	54,949
	5,870		5,902
	4,119		4,412
	16,361		13,907
	4,035		4,468
	7,562		7,964
	2,885		2,250
	4,071		3,369
	3,213		3,484
	10,780		9,193
18,519	18,506	18,350	18,180
6,738	6,248	7,198	6,537
795	715	712	684
15,668	28,176	13,602	18,448
53,854	34,455	48,222	35,932
3,522	3,652	2,922	3,076
1,046	641	861	538
12,155	9,459	10,179	9,241

are given. [c]Includes data for spreader and calendering-type resins. [d]Includes data for acrylic, nylon, and other molding materials. [e]Includes data for epichlorohydrin, acrylic, silicone, and other protective-coating resins. [f]Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

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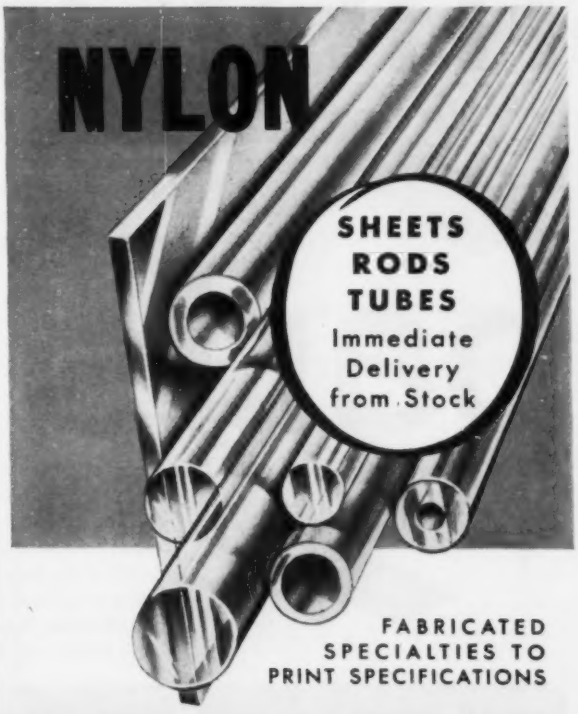

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epoxy

The material is molded by techniques developed by Kurz-Kasch from resinous materials supplied by Booty Resineers Inc., Newark, Ohio.

molded

It is no longer necessary to limit yourself to casting procedures to get the benefits of epoxy. Molding cycles are relatively fast; production costs are therefore low. Tooling costs are comparable to other high-pressure plastics.

parts

These parts have exceptional toughness, ability to hold inserts, resistance to moisture and most chemicals, and excellent insulating properties. Call your nearby Kurz-Kasch representative for quotes on parts molded of this material to your specs. Kurz-Kasch, Inc., 1415 South Broadway, Dayton 1, Ohio.

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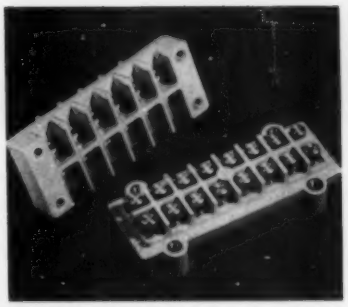

Electrical heater terminal boards for pilot compartment (left) and for passenger cabin (right) are compression molded of alkyd

Molded alkyd for terminal board

The low shrinkage factor that characterizes alkyd molding compounds was one of the decisive considerations that led to the choice of the material for compression molding a line of aircraft heater terminal boards. Good arc resistance and the fact that molded alkyds will withstand continuous service at elevated temperatures (up to 400° F.) were also important factors.

The terminal boards are used in the electrical heaters built by AiResearch Div., The Garrett Corp., Los Angeles, Calif., for installation on the new Lockheed Electra Turboprop airliners. They distribute power from a central source to heaters in the passenger and pilot compartments.

The molded boards are relatively small in size, 6 by 2½ by 1¾ in.; nevertheless, they incorporate a large number of massive metal inserts—20 for the passenger compartment board and 16 for the pilots' cabin board. Yet there is no distortion and cracking of parts. The molder attributes this to the low shrinkage of the material.

Variations in cross-section posed another problem. These range from 3/32 in. for the thin barrier webs to ¾ in. around the inserts. Again, the material—plus careful mold design—offered the solution.

Credits: Plaskon Alkyd 446 by Barrett Div., Allied Chemical Corp., New York, N. Y.; molds and molding by Maas-Rowe Carillons, 3015 Casitas Ave., Los Angeles, Calif.

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Color, APHA	50 max.
Odor	Faint
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Free acidity, as acetic acid	0.01% max.
Ester content	99.0% min.

Other Uses—
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CUSTOM MOLDS FOR SHORT-RUNS. Booklet illustrates and describes Minnesota custom molding firm's work with thermoplastics and thermosets in the production of short-run molded plastics. Dayton Rogers Manufacturing Co. **(F-805)**

FIBERGLASS MOLDING PRESSES. 4-page illustrated leaflet describes performance and construction, gives specifications of a line of 100, 150, 200, fiberglass molding presses. Erie Foundry Co. **(F-806)**

SPRAY GUN FOR REINFORCED PLASTICS. Booklet presents spray gun-like tool that cuts glass rovings into desired lengths and then applies it, together with mixed resin, catalyst and promoter, to mold. Deposition table included. Rand Development Corp. **(F-807)**

PRODUCT DECALS. Folder gives information on two adhesive films, yellow or white vinyl, and metalized chrome-tint "Mylar" polyester which can be printed, silk-screened or die-cut and used for plastics product identification or decoration. Fasson Products. **(F-808)**

GRANULATORS. 4-page catalog pictures and gives specifications for a line of heavy duty multiple-knife plastic granulators with hourly capacities ranging from 500 to 2500 lbs. Ball & Jewell, Inc. **(F-809)**

PLASTICS MOLDING PRESSES. 6-page illustrated brochure describes two 200-ton semi-automatic, high-speed, self-contained hydraulic presses for compression molding, and for top or bottom transfer molding. F. J. Stokes Corp. **(F-810)**

TEMPERATURE CONTROLLER. Illustrated 2-page bulletin describes and gives specifications of an electronic, single-knob proportional temperature controller with independent control and temperature indicating functions. Electronic Processes Corp. of California. **(F-811)**

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ELECTRIC HEATING UNITS. 49-page illustrated catalog gives information on electric strip, tubular, cartridge and ring heaters for a variety of industrial uses. Lists types, sizes and ratings. Edwin L. Wiegand Co. **(F-813)**

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PLASTICS. 4-page illustrated data sheet lists physical properties and available sizes of extruded plexiglass and lucite acrylic rods, tubes, and shapes. Ace Plastic Co. **(F-815)**

PULVERIZING MACHINES. 4-page illustrated brochure describes series of centrifugal pulverizing machines with maximum capacities from 16,000 lb./hr. to 250,000 lb./hr. Includes specifications and tables. Entoleter Div., Safety Industries, Inc. **(F-816)**

PLASTISOL STABILIZERS. Two 2-page leaflets describe recommended applications, usages and physical properties of two new liquid stabilizers for plastisols: barium-zinc and cadmium-barium-zinc. Ferro Chemical Corp. **(F-817)**

PARTICLE SIZE CONTROL. 32-page brochure discusses the construction and applications of a series of pulverizing machines. Includes illustrations, dimensions, and capacity tables for different materials. Pulverizing Mach. Div., Metals Disintegrating Co., Inc. **(F-818)**

VINYL PLASTISOL. 12-page booklet discusses production and application methods, recommended uses and properties of a line of "Chem-O-Sol" compounds which exist as non-volatile liquids and are converted to solids by heating. Chemical Products Corp. **(F-819)**

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STOCK PLASTIC KNOBS. Extensively illustrated 8-page catalog gives specifications for a line of stock molded thermosetting knobs available in any desired color in phenolic or in urea. Waterbury Companies, Inc. **(F-826)**

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WIRE AND CABLE COATING. Illustrated booklet discusses use of polyethylene and nylon resins in insulation and jacketing of wire and cable. Includes data on properties and wire coating techniques. E. I. du Pont de Nemours & Co. **(F-828)**

PRESSES FOR REINFORCED PLASTICS. 4-page, illustrated brochure describes line of electrically powered, automatic, semi-automatic or manually controlled presses for reinforced plastics with capacities from 25 to 600 tons. Specifications and data included. Dake Corp. **(F-829)**

PVC PIPE. 4-page price list tabulates available sizes and pressure ratings of line of unplasticized polyvinyl chloride pipe stocks of high chemical or impact resistance. Alpha Plastics, Inc. **(F-830)**

PORTABLE HARDNESS TESTER. Data sheet describes a line of portable hardness testers for plastics and metals. Engineering data and prices are included. Barber-Colman Co. **(F-831)**

VINYL PRINTING. 5-page bulletin on a system of gravure inks and coatings based on unplasticized PVC resin for multicolor printing of vinyl film, sheeting and coated fabrics describes properties, methods of use, suggested applications. Claremont Pigment Dispersion Corp. **(F-832)**

GUIDE TO POLYETHYLENE MOLDING. 8-page manual gives detailed recommendations for designing and molding parts of high-density polyethylene. Includes data on mold design, cylinder and mold temperatures, shrinkage. W. R. Grace & Co. **(F-833)**

PLASTIC SHEETING. 4-page illustrated leaflet outlines the types, formulations, and uses of this company's light, medium and heavy gauge "Kodapak" thermoplastic cellulose ester sheeting. Includes tables and charts. Eastman Kodak Co. **(F-834)**

HOBBING PRESSES. 4-page, illustrated bulletin describes line of quick-closing and quick-opening 300-ton to 5,000-ton hobbing presses. Specifications, operational data and uses are included. Elmes Engineering Div., American Steel Foundries. **(F-835)**

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AUTOMATIC PAINTING MACHINES. Illustrated bulletin describes a line of automatic, single spindle, air-operated, dial controlled rotary sprayers suitable for the spray finishing of cylindrical and rectangular parts. Conforming Matrix Corp. **(F-838)**

HEAT SEALER AND LABELER. Illustrated bulletin describes an automatic, continuous, rotary heat sealer and labeler requiring only one operator. Optional hole punching, coding and staggered in-feed equipment is also presented. Doughboy Industries, Inc. **(F-839)**

EXTRUSIONS FUNDAMENTALS. 32-page manual presents basic information on thermoplastic extrusion equipment, processes and theories. Tables, graphs, diagrams and illustrations included. Monsanto Chemical Co. **(F-840)**

PLASTIC CLAD FINISHES. 4-page illustrated booklet discusses dip-fusion process of cladding metal stampings, castings, wire products, etc., with plastics. Includes performance requirements chart. Nat'l. Polymer Prod., Inc. **(F-841)**

INJECTION MOLDING MACHINE. Illustrated 6-page booklet describes a hydraulic press designed to overcome problem of molding around inserts and cores. Press handles mold sizes of 6" x 5" x 5¾". Specifications listed. Newbury Industries, Inc. **(F-842)**

GLASS-REINFORCED PLASTICS REPAIRS. 16-page booklet discusses techniques and materials for repairing minor scratches, dents, gouges, holes and fractures in resin-impregnated glass fibers. Goodyear Aircraft Corp. **(F-843)**

EPOXY COMPOUNDS. Brochure contains information on a data sheet line of epoxy foaming resins and potting and casting compounds. Includes specifications, uses, directions and price lists. Minneapolis-Honeywell Regulator Co. **(F-844)**

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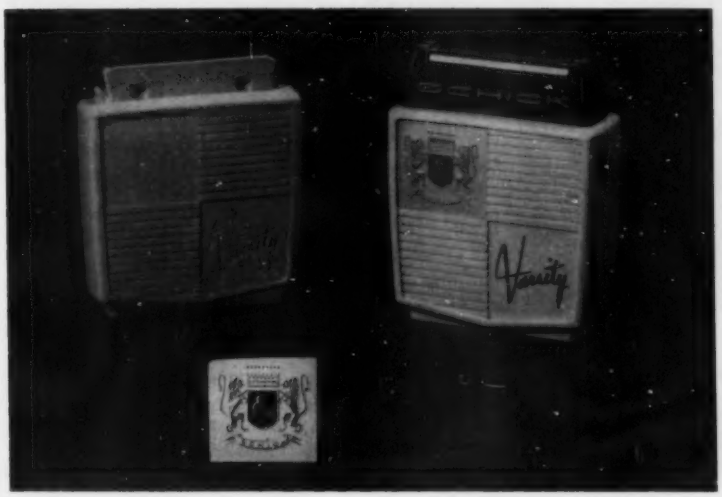
Anodized aluminum for molded plastics

Here's one more successful marriage of plastics and metal: thin aluminum plates, selectively color anodized, are being used for labeling and decorating a variety of plastics products. The plates, of 3 to 5 gage, may be used with either of two adhesive systems. For easy installation, they are supplied with a thermoplastic pressure-sensitive adhesive on the back; for applications which must withstand heat, such as on the electric frypan handles shown above, the plates are used with a solvent-activated thermoset adhesive.

As labels, the aluminum foil plates combine the easy installation of decals with the permanency of heavy metal plates mounted by rivets. As design elements, they are being used to dress up consumer products molded of plastics. The Park Nameplate Co., Inc., Flushing, N. Y., has merchandised this concept so actively that several appliance manufacturers are now designing radio and TV cabinets, air conditioners, etc., to take advantage of the plates as a styling device.

A special development of Park's is a 3-dimensional plate which combines both bright and matte finishes on the same surface, with color and relief in register. Two such plates (front and back) are used effectively on the Schick Varsity shaver shown below.



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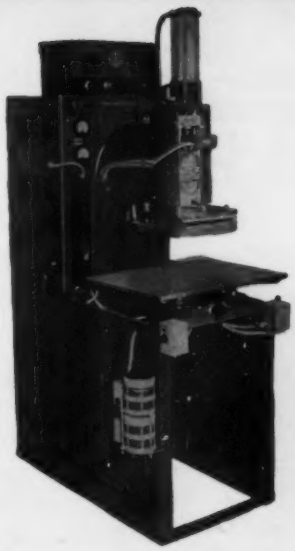

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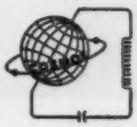

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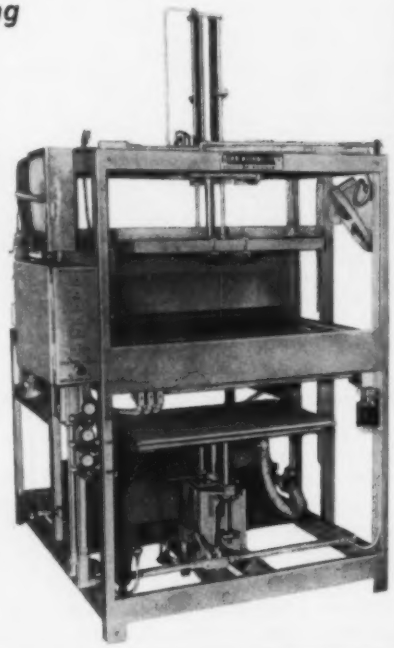

For full details write:

BROWN MACHINE COMPANY
Beaverton, Michigan

Waterproof aid kit

Industrial first aid kits have to be protected from moisture, since they are often stored outdoors. For this reason such kits have long been packaged in metal boxes equipped with waterproof gaskets. Now a different approach to the problem has been perfected: individual packaging in polyethylene of each item or "unit pack" of the first aid kit.

In new unit packs for first aid kits developed by E. D. Bullard Co., Sausalito, Calif., three types of polyethylene packaging are used. Dry elements are packaged in polyethylene film, with two pull tabs provided for convenient removal of the wrapping. Because of the transparency of the film, the name of the product and directions for use can be read while the package is still sealed. For liquid items of the first aid kit, Bullard uses polyethylene bottles: ointments are packaged in polyethylene squeeze tubes.

This "three way" packaging with polyethylene replaces cardboard boxes, which absorb moisture and deteriorate. Besides offering damp weather protection, the packages keep contents free of dirt, dust, and grease.—END

Underwater demonstration shows the complete moisture resistance of a new system of packaging first aid kit items in polyethylene. Three different types of packages are used: film packs, bottles, and squeeze tubes. (Photo, E. D. Bullard Co.)

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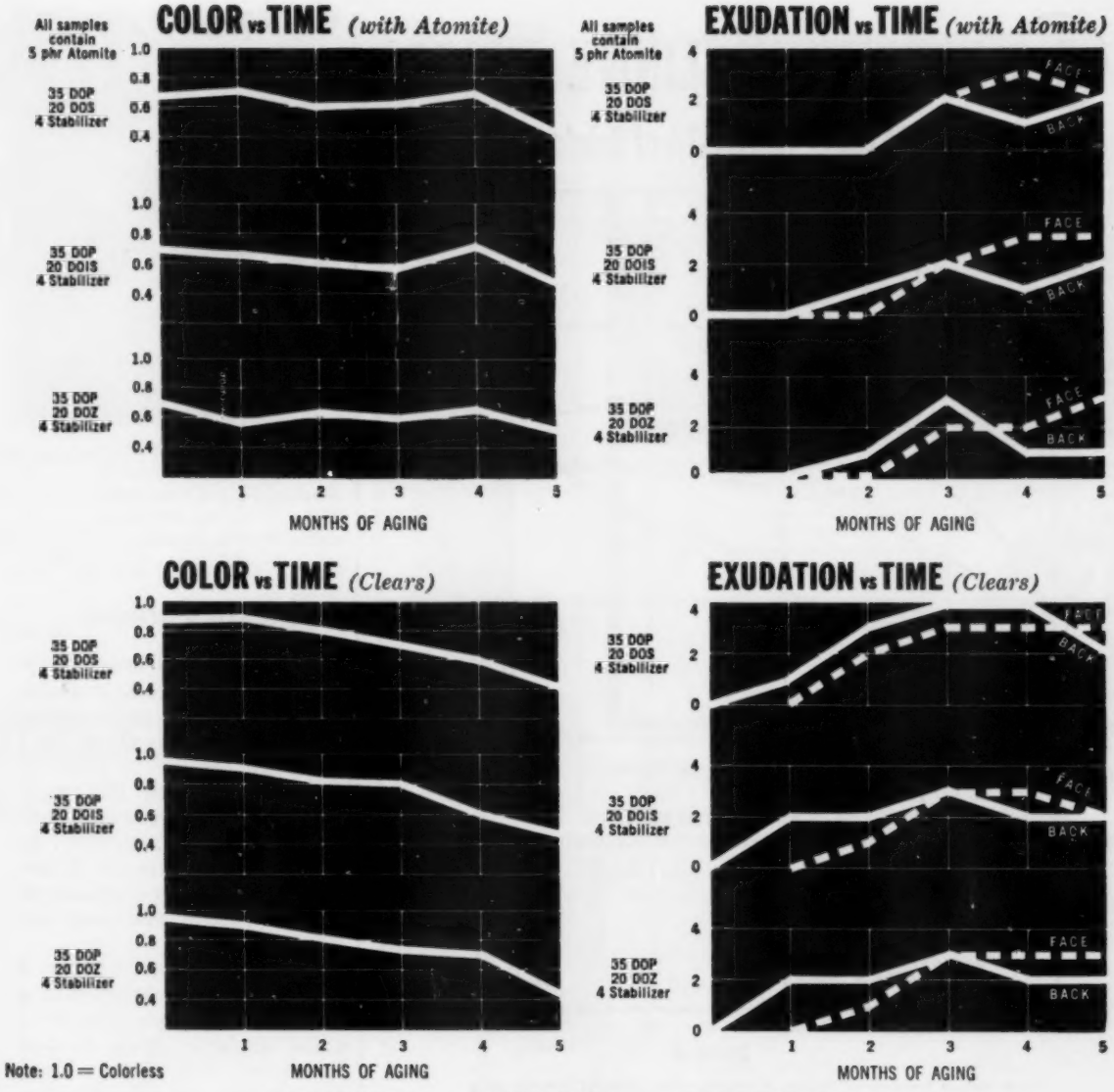
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BACK
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EXUDATION vs TIME (Clears)
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Florida aging tests show ester of **ISOSEBACIC® ACID** matches performance of other vinyl plasticizers ...and it is more economical

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ISOSEBACIC acid is a new synthetic intermediate made by U.S.I. A mixture of three C-10 dibasic acids —2-ethyl suberic, 2, 5-diethyl adipic, and sebacic acids— it offers a number of interesting properties. Other uses include—intermediate for polyamides, polyesters, polyurethanes and alkyd resins.

ISOSEBACIC acid soon will be available in commercial quantities from U.S.I. at Tuscola, Ill. Price comparisons with competitive intermediates indicate that ISOSEBACIC acid will afford important savings.

This might be a good time to evaluate ISOSEBACIC acid for your operations. Send for data sheets and samples.

*Test results supplied through the courtesy of Daocy Products Co., Cambridge, Mass.

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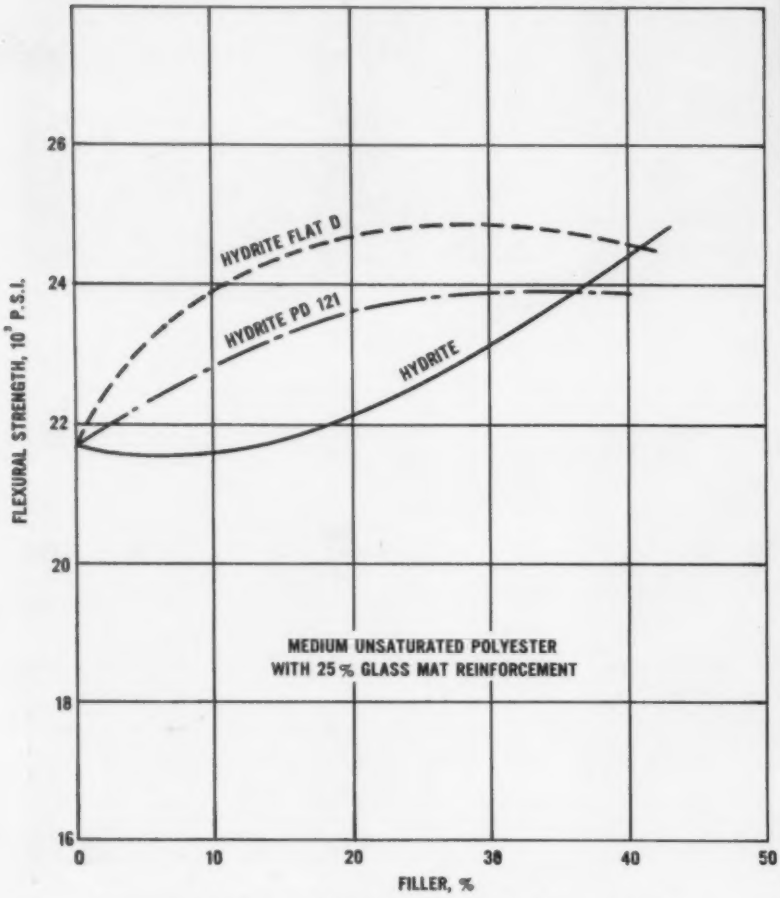

How various loadings of Hydrite Kaolinites affect Flexural Strength of a Medium Unsaturated Polyester.

The use of Hydrite Kaolinite in reinforced polyesters will maintain their flexural strength over a wide range of filler concentrations. This is indicated in the accompanying graph, showing the effects of various loadings of three standard Hydrite Kaolinites on a typical polyester laminate system. Similar effects are noted with epoxy and diallyl phthalate moldings.

In addition to maintaining or improving the strength characteristics, Hydrite Kaolinite fillers have other beneficial effects in reinforced plastics such as: maximize smoothness and gloss; reduce exotherm and shrinkage; minimize water absorption; improve electrical and chemical properties; aid machinability and fabrication; reduce plastics material costs.

Examine the possibilities for improvement of your formulations with Hydrite Kaolinites. Send for further information and free samples.

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Original copy is in foreground. Operator removes developed print from tube. When not in use, developer bottle (left) is capped

All-plastics printer

Extruded butyrate tubing (Tenite, Eastman Chemical Products, Inc.) and formed vinyl sheeting (Boltaron, Bolta Products, Inc.) are effectively used to make the virtually all-plastics PELprinter portable copying machine simple and fast to operate. The unit represents another example of how well plastics can be adapted to office equipment machinery applications.

To use, the original copy and a sensitized paper are placed in a transparent butyrate tube for a timed exposure to a built-in fluorescent lamp. The exposed paper is then inserted in another butyrate tube which is placed upright over a well formed in a platform insert (at left in photo). Ammonia fumes released from a bottle in the well develop the picture. The carrying case—housing all components—and contoured platform insert are formed of vinyl sheet by the plug-and-ring technique. Total weight is 5½ pounds. The printer operates from a 110-v. line, but can be adapted for use in automobiles, boats, or planes. Retail list price is $70.

Credits: Manufactured by PELprinter, Inc., 555 Central Ave., Orange, N. J.; tubes extruded by Busada Mfg. Corp., 58-99 54th St., Maspeth 78, N. Y.; case and platform insert formed by Product Engineering Labs. Co., Inc., 316 Adams St., Newark 5, N. J.

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5 to 9 "	15.60 " "
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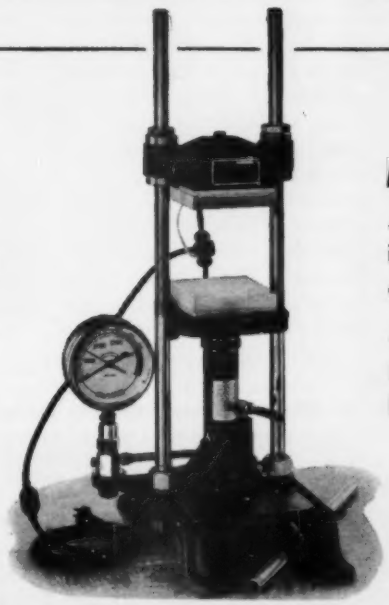

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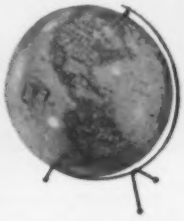

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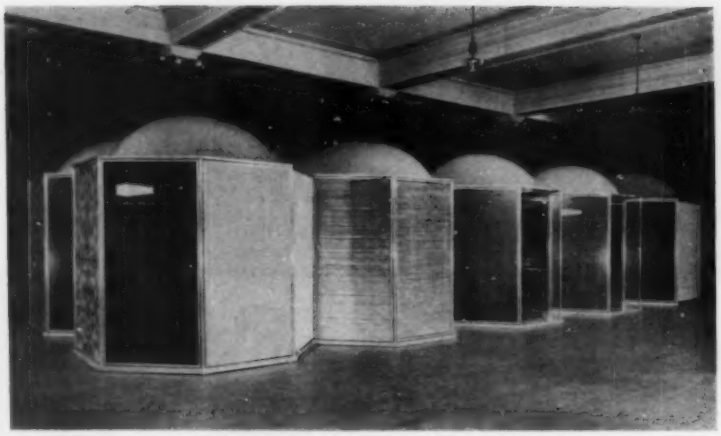


Overall view of new convention display. Ten modules are used, but exhibit can be housed in single module if desired. Domes, made of acrylic, admit ambient light, subdue exposition noise

Acrylic in revolutionary convention exhibit

In a radical departure from traditional convention displays, Walter Dorwin Teague Assocs., New York, N. Y., has designed for General Foods a "booth" that involves acrylic sheet material as an important part of the design. Made up of 10-ft. modular sections, each one topped with a ¼-in. formed white translucent acrylic dome, the exhibit made its debut at the recent exposition of the National Restaurant Assoc. in Chicago, Ill., where it housed the display of GF's Institutional Products Division.

Because of the modular design, it is possible to scale the exhibit to meet particular exposition requirements. Thus, instead of using 10 sections, as in Chicago, displays can consist of only five sections, or three, or just one. This flexibility results in considerable economies.

Other reasons for the novel design involve the desire to present the products in a more intimate atmosphere. The structure of the exhibit acts to subdue the usual convention noise, while the acrylic "roof" permits passage of light to illuminate the interior. Spaces between domes are covered by flat ¼-in. white translucent acrylic panels.

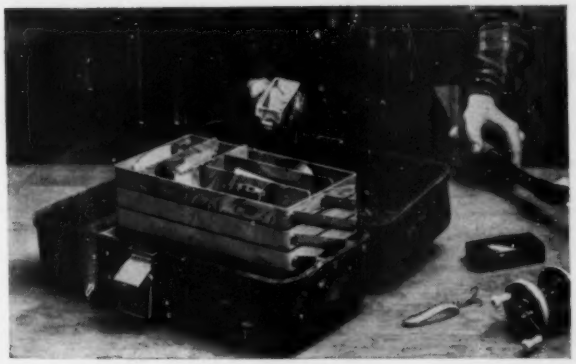
End panels of each section consist of flat ¼-in. acrylic sheet with a sand-blasted design. These panels add a decorative touch and allow light to filter through.

Credit. Plexiglas acrylic sheet fabricated by Wasco Products, Inc., Cambridge, Mass.

Inside view of modular exposition display

THE PUNISHMENT OF WASH DAY. The exceptional moldability and high gloss of Styron® 440M make it a natural for this water conditioner dispenser for automatic washing machines. This Dow high-impact polystyrene provides extra strength for a long, rugged service life, outstanding heat resistance to cope with washing machine temperatures and excellent resistance to chemical attack by laundry detergents. Styron 440M is available in a wide range of sales-stimulating colors—built-in colors that can't chip, fade or wash away.

Designed to take punishment . . . hi-impact Styron



PUNISHMENT FROM THE ELEMENTS. This attractive, rust-proof tackle box is molded of Styron 480, a super tough Dow polystyrene. A unique green and white marbleized effect gives added sales appeal to the high-gloss finish. A clever tongue-in-groove design seals out water when the box is closed, allowing it to float. This complicated mold problem was easily solved by the excellent molding characteristics of Styron 480. The latch is made of nylon and the remaining hardware is brass.

The versatility of Styron and other Dow plastics helps designers meet the challenge of creating new products and techniques. Dow plastics provide many characteristics that lead to economy and practicability. And Dow researchers are continually working on new, improved formulations that will allow even greater design flexibility. Keep in touch with these advances . . . keep in touch with your Dow man. THE DOW CHEMICAL COMPANY, *Midland, Mich., Plastics Sales Dept. 1513B.*

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NYLATRON GS molded parts are more rigid—have higher resistance to deformation under load.

DIMENSIONAL STABILITY
NYLATRON GS provides better size control in use and more accurate molding tolerances. Coefficient of linear thermal expansion is about one half that of nylon 101.

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NYLATRON GS runs cooler, smoother and quieter with less friction to generate heat. As a dry bearing it has been used at 50% higher pressure and velocity ratings than nylon 101.

HEAT RESISTANCE
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Non-conductive ladder

Lightweight ladder made entirely of fibrous glass-reinforced plastics combines ease of handling with protection against electrical-shock hazards. Its non-conductivity makes it especially useful to utility companies and other firms that use ladders for electrical installation and repair.

The ladders are produced by Hopfeld Industrial Mfg. Co., San Rafael, Calif., using Polylite polyester resin (Reichhold Chemicals, Inc.). A specially designed 100-ton press molds the siderails in 20-ft. segments; these rails are essentially hollow and are 1 by 3 in. in cross section. Rungs are separately molded and bonded into the side pieces with Polytool epoxy resin (also Reichhold). Sand-like particles embedded in the rungs serve as protection against slipping. Side pieces are produced with yellow pigmentation, rungs with black, integrally molded-in. No repainting is necessary.

Straight and extension types are offered. Straight ladders weigh about 1½ lb. per lineal foot, extension ladder 1¾. This is lighter than most aluminum equivalents. A 20-ft. straight ladder, for example, weighs roughly 30 lb., light enough to be easily carried and handled by one person.

The reinforced plastics ladder is competitive in cost with wooden and metal varieties, and is claimed to be superior to them in many respects: it is splinter-proof; will not crack or break when dropped; requires minimum maintenance; is buoyant in water, will not swell or increase in weight when exposed to rain or humid atmospheres; is more durable; and offers greater safety.

This is not the first reinforced plastics ladder to be placed on the market. What distinguishes it from those that have preceded it is that both the side pieces and rungs are made of polyester-glass. Other reinforced ladders have been offered with RP side pieces and aluminum or magnesium rungs.

Substitution of fibrous glass-reinforced polyester for the metal components increases the electrical safety factor of the product considerably.—END

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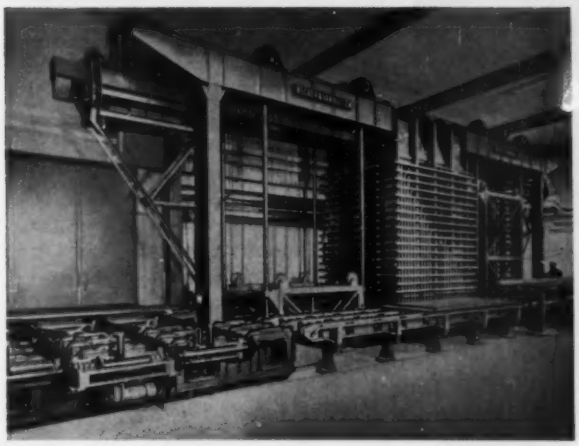

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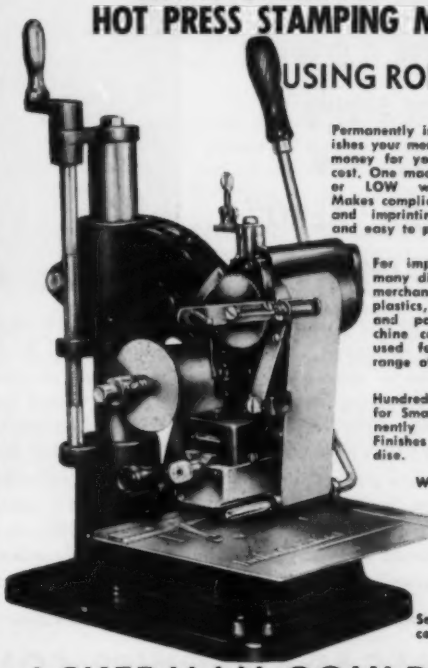

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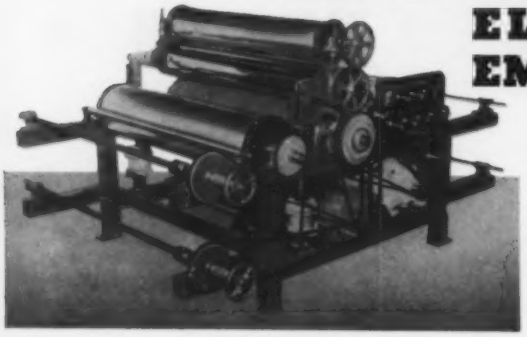

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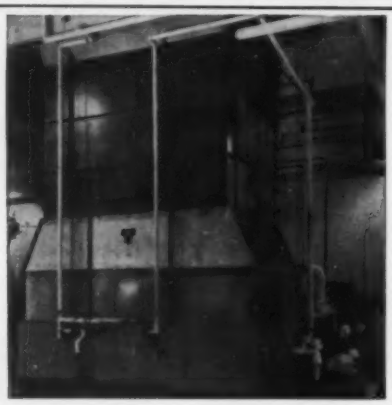

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Space age

(*From pp. 105-110*)

examined afterward; they either succeeded or failed, hit or miss. From this kind of testing, it was difficult to draw enough sound knowledge to design a material for a particular job; the materials were there, but largely out of reach of the spearhead of scientific knowledge in the field.

Not much more is known even today. But a start has been made toward a broad program of research. Substantial separate contracts have been granted to General Electric Co. and Avco Manufacturing Co. for heat research. The GE contract, for $159 million, is for research and development of nose cones for the Atlas ICBM and Thor IRBM. In turn, GE has subcontracted $80 million of this work. The Avco contract, $110 million, is for development of a nose cone for the Titan, which, like the Atlas, is a liquid-oxygen-fueled 5500-mile ICBM.

These contracts add up to the broadest program of heat engineering ever undertaken; they will help get a man to the moon—and back.

Test temperatures a problem

One of the first problems of these researchers was to find a means of creating the high temperatures necessary; if a material is to be tested at 10,000° F., a way must be found to create and control that kind of heat. Along these lines, GE's Missile and Ordnance Systems Dept. in Philadelphia has built three new specialized tools of heat research: 1) a solar furnace, which can create steady temperatures in the range of 6000° F. over a comparatively large area; 2) a water-stabilized carbon arc which will reach 26,000° F., and 3) a shock tube which can most nearly simulate re-entry conditions by combining high heat with fast-moving gases. (See "Behavior of reinforced plastics at very high temperatures," p. 155).

Avco also has in operation a carbon arc that will produce 8500° F. while duplicating the chemistry of the air, as well as other high-temperature equipment, but basically the company's

approach to the field has been in terms of changing the "environment"—preventing high heats from building up at all. GE, on the other hand, has been using a materials development approach, and has already uncovered some startling behavior of plastics materials that may have great promise for the future. In one test, a phenolic sample filled with nylon cloth made the best showing, with a far slower erosion rate than samples of phenolic-glass and phenolic asbestos. Exposed to 12,500° F., the phenolic-nylon sample (57% resin) eroded at the rate of ⅛ in./minute. The sample which made the next best showing, a phenolic-glass cloth composition with 65% resin content, eroded about 35% faster.

Since nylon melts at 510° F., a theoretical elucidation of these startling test results was in order. That offered by GE researchers is based on the fact that when hydrogen atoms are split off the plastic structure, great quantities of heat are absorbed, and the structure behaves like a heat "sponge." Of course, the production of hydrogen atoms takes place only at temperatures high enough to dissociate hydrogen—about 6500° F. At temperatures of 3200° F., nylon-filled phenolic showed a relatively rapid erosion rate. Besides the "sponge" effect, there is another important factor in the picture: the large volume of gas generated when the organic material is heated; this gas interferes with the convective heat transfer to the body.

All of this indicates, of course, that organic fillers for plastics may have great value for nose cone applications, but probably not for blast tubes.

Hughes Aircraft Co. is also engaged in extensive research on heat resistant plastics. Though the company was originally drawn into the work about four years ago as a result of military contracts for specific parts, Hughes is now looking to the future and performing basic research with no particular end-application in view. Hughes has developed a plastic material—probably phenolic—with random reinforcement that will withstand temperatures of 6000° F. and gas velocity of

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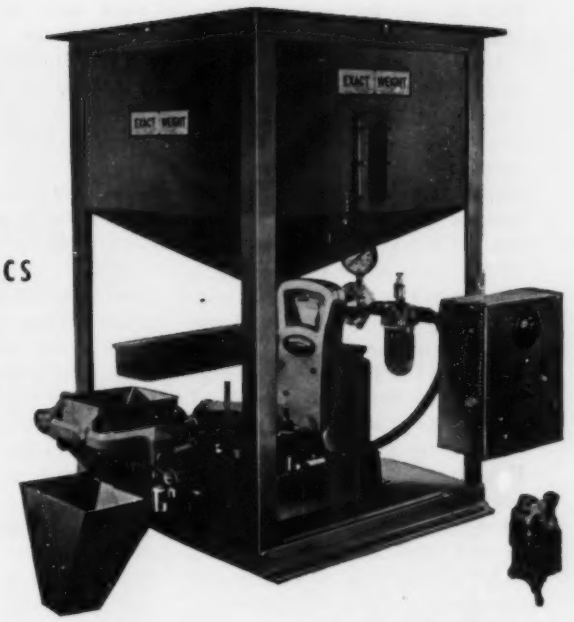

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8000 ft./sec. for an impressive length of time.

Hughes, deeply involved in high temperature radome work, has constructed an oven which will produce up to 1500° F. under careful control. For preliminary thermal shock tests, company engineers plunge plastic samples into molten metal. The temperatures generated by these methods may seem low in comparison with blast-tube or re-entry heating, but aircraft companies building both missiles and manned aircraft have to investigate both ends of the high-heat scale at once.

In its reinforced plastics work, Hughes has made considerable use of the woven sock process, wherein a weaving process is used to sew glass cloth to the exact shape of the finished radome. A succession of these socks, impregnated with resin, are used until the proper thickness is built up.

More reasons than one

Today's intensive concentration on ultra-high-heat-resistant plastics is certain to produce materials and methods for much broader use at lower (but still high) temperature levels. For example, as modern aircraft fly faster, their skins are subjected to more aerodynamic heating. Thus, a radome on Douglas Aircraft Co.'s new jet liner, the DC-8, has a continuous operating temperature of 400 to 450° F. due to the speed of the jet in the atmosphere. Douglas uses an epoxy-glass laminate on this job. In the near future, military jets are expected to reach speeds of Mach 5 and 6. New materials have to be developed to meet this need, and plastics are most likely candidates. Other "hot service" applications include the use of interior engine parts in hotter, more powerful engines.

Jet turbine blades that must withstand in excess of 500° F. in continuous service are being molded today by Cincinnati Testing and Research Laboratories. The phenolic blades weigh ¼ as much as steel (in an application where every ounce counts, since it is weight that must rotate), offer designers more flexibility, and would cost less to produce on a high production basis.

One authority in the field feels that engine parts of plastics—pistons and cylinders—are not too remote a possibility.

The electronics industry could use high temperature plastics in many areas, especially as miniaturization becomes more widespread and electrical insulation materials must shrink in thickness. A prime example of an electronic component which can make excellent use of the high temperature materials is the common capacitor.

Industry has come a long way

In 1951, a specific goal of phenolic research was flex strength of 30,000 p.s.i. after a half hour at 500° F. Today, a host of phenolic materials—one of the earliest and best known is CTL's 91-LD—will deliver flex strength of 60,000 p.s.i. after 200 hours at 500° F.

Where do we go from here? The answer is clear: to the moon and back!—END

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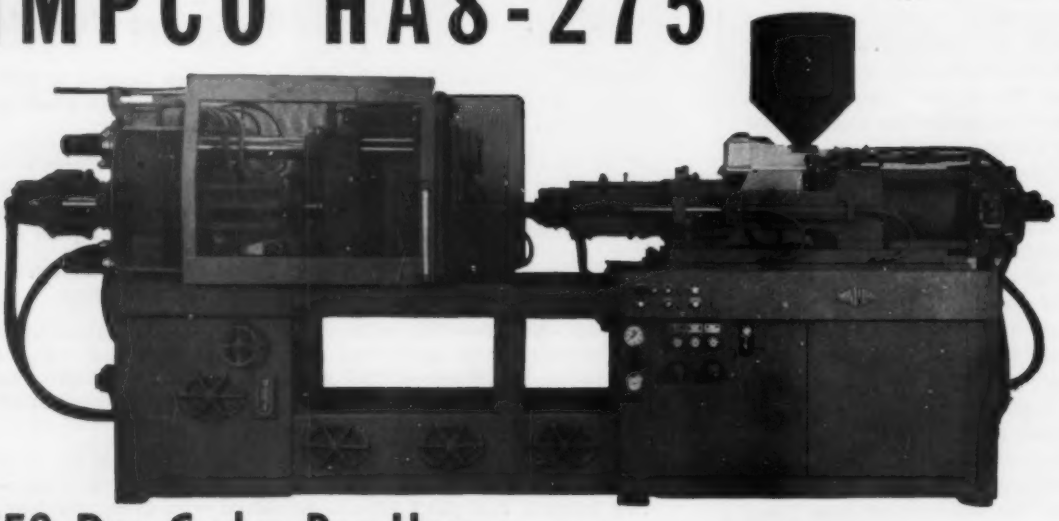

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Pencil sharpeners

(*From pp.* 111-113)

metal name plates on these receptacles fit a recess molded in the front of the top half and are secured by tabs turned back on the inside of the plastic part. This same type receptacle will also be molded of transparent impact type acrylic for use on certain models.

Nylon pinion gears

Functionally, the molded nylon pinion gears used in the cutter head assembly are perhaps the most interesting of the plastics parts now employed by Apsco. They replace die-cast metal gears on approximately 50% of all the pencil sharpeners made by the company.

Experience to date indicates that in addition to their quieter operation, the nylon gears may be expected to far outlast the die-cast gears. The consequent reduction in replacement requirements marks an important saving to the company over long periods of time.

The resiliency of the nylon gears permits them to be securely press fitted onto the cutter shafts with a hydraulic press operation. According to R. J. Brand, general manager of Apsco's Rockford, Ill., plant, the company plans to switch 100% to the nylon gears on all its models in the future.

Apsco's highly rewarding program with plastics parts for the nation's leading line of pencil sharpeners marks another success story for an enterprising manufacturer eager to take advantage of modern materials, design and production methods. And instead of being faced with an anticipated dwindling market, because of the advent of ball point pens and liquid lead pencils, Apsco now finds itself busier than ever.

Credits: Nylon for chucks and pinion gears, supplied by Du Pont Zytel 101. Cycolac ABS resin for receptacles, Marbon Chemical Div., Borg-Warner, Gary, Ind. General purpose styrene for handle knobs, Monsanto Lustrex. High-impact styrene for Midget sharpener receptacles, Dow Styron 475.

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Furniture

(*From* pp. 114-117)

combined. Estimates for 1958 go as high as 3 million.

A new factor that has entered the picture is the introduction of reinforced plastics drawers for furniture. In the past, RP drawers were almost exclusively used in work benches, school desks, and quasi tote-box applications. Now it is reported that a line of RP drawers has been developed which is being tested by a large furniture manufacturer. The full impact of RP drawers, however, will not be felt till some time next year.

It is difficult to make an accurate price-wise comparison between plastics and wooden drawers. Furniture manufacturers do not keep exact records on the cost of wooden drawers, because of the feeling that they involve simply a utilization of waste lumber. It is generally agreed, however, that plastics drawers cost more than wooden ones. A typical price for a plastics drawer 32 by 16 by 5 in., injection molded of styrene, is $3.50. Counterbalancing this cost are advantages that vary from plant to plant, but which include simplification of drawer material inventory; virtual elimination of fitting operations—with consequent production increases in the cabinet room of up to 50% with the same labor force; greater production without additional equipment; and reduction of case good assembly and finishing costs.

Cost of plastics drawers ranges upward in the following order: vacuum formed styrene, injection molded styrene, compression molded phenolic. Where RP drawers will fit in is not yet clear, but it is anticipated that they will find their level between formed and molded styrene drawers.

By the end of this year, it is expected that close to 30 case good manufacturers will have incorporated plastics drawers in some of their lines. What is even more important is that designers are becoming more and more receptive; in fact, they have become enthusiastic salesmen for plastics drawers . . . which makes all concerned optimistic.

Legs: This is a relatively new

market area for plastics, with molded impact styrene the major contender. Molded butyrate and vinyl plastisols are also in the picture, but volume is small. Reinforced plastics have found application in office chair bases. Early efforts to use styrene copolymer failed because of cost factors.

In 1957 styrene resin usage for furniture legs was estimated at 350,000 lb.; this is expected to go up to 3 million lb. by 1960. In terms of numbers, the potential for plastics legs is a staggering 200 million annually. However, at the present time less than 1% of this potential has been realized. Four molders are now in the field. The biggest problem they are facing is to duplicate wood grain. Several models are produced in solid colors, but the demand for grained finishes is high. The finish has to be molded in and represents major coloring problems.

It is felt by many in the field that the future of plastics furniture legs lies in designs that take advantage of the properties of plastics and that cannot be duplicated economically in wood. Efforts toward that goal are underway. Once they are successful, major volume consumption is anticipated.

Styrene legs are selling below wooden legs of equivalent dimensions. For example, a 4-in. molded styrene leg sells for 21¢ in quantities of 5000. A comparable maple or oak leg comes to almost 60 cents. Aluminum and steel legs are also in the picture, but their application is specialized.

Miscellaneous: In addition to the above noted case good applications, these are of interest:

Drawer and door pulls of molded urea are used in fair volume. The practically unlimited color range make them attractive for today's decor in almost every room of the house.

Drawer glides, both of nylon and high-density polyethylene are contributing to smooth drawer action in the better types of furniture. Reiss Mfg. Co., New York, N. Y., has pioneered this application and reports excellent results. Prolon Div. is now also molding such glides for use with its styrene drawers.

Casters for furniture legs also

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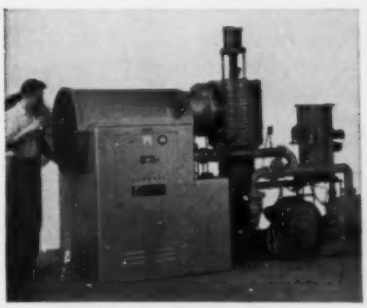

30″ coater—model LC1-30
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provide a steady small-volume outlet for plastics. Materials involved are styrene, nylon, butyrate, and polyethylene. Wheels are generally phenolic.

Seating

Several plastics materials have carved themselves an appreciable portion of the seating market in both home and institutional applications.

Molded chairs: Between 3 and 4 million lb. of reinforced plastics per year go now into furniture, with the largest portion for molded seats. The institutional field has been particularly receptive, biggest users being schools, offices, hotels, and hospitals. Among home seating suppliers, Herman Miller Furniture Co., Zeeland, Mich., Knoll Associates, and Built-Well Furniture Co., Philadelphia, Pa., are the major manufacturers, with Herman Miller offering approximately 50 different models.

Molded RP chairs are essentially in the same price range as molded plywood chairs, their most immediate competition. They have the advantage of integral color and wider design latitude. They are also generally of one-piece construction, while plywood chairs require separate backs and seats.

Upholstery material: Vinyls, backed (including laminates) and unsupported, dominate plastics usage in this market. Total resin consumption in 1957 is estimated between 6 and 8 million pounds. In terms of yardage, 12 million sq. yd. of supported and about 30 million sq. yd. of unsupported vinyl upholstery fabrics were shipped that year. Here, again, the institutional market is the greatest consumer. Vinyl upholstery for home use has had pretty rough going, especially in living room suites. But improved textured designs, availability of porous materials, and heat-sealed covering have all tended to break down that consumer resistance. The major advantages of this material are its ease of maintenance and its long-wearing characteristics.

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supported material competes with the lower-priced fabrics.

Polyethylene monofilament is used in conjunction with woven fabrics to achieve deep three-dimensional effects (e.g. U. S. Rubber's Trilok); saran monofilament has been similarly used. In terms of poundage, the last two represent small applications so far.

Wire chairs: Several manufacturers produce chairs with wire backs, often coated with vinyl plastisol. Volume is small.

Cushioning: Two plastics materials dominate this field: urethane and vinyl foam. Progress has been spectacular for urethane. From a consumption of 2 million lb. in 1957, usage is expected to reach a rate of 20 million lb./year by the end of 1958. About 125 furniture makers are using the material for cushioning and backing. One firm makes a reversible mattress of uncored slab stock. Urethane foams for cushioning are generally of the polyether variety; those for sofa and chair backs are generally polyester-based. There is no essential price difference between urethane and rubber latex foam for cushioning, but urethane has the property edge.

No figures are available on the use of vinyl foam for cushioning, but consensus is that it is small. Methods for molding cored Elastomer vinyl foam have been perfected and are expected to garner a share of the living room furniture market for this material.

Outdoor furniture

Sales of outdoor furniture reached $224 million at wholesale in 1957. Plastics share in this market is fairly large, with saran, PVC, reinforced plastics, and polyethylene participating.

Dow estimates present saran consumption for outdoor furniture at close to 4 million pounds. Main usage is webbing on summer chairs. Roughly 1 million lb. of vinyl go into this market, with greatest use as chair pads (heat-sealed envelopes over a felt filler or vinyl foam).

High-density polyethylene monofilaments have tackled this market for about two years now. Resin consumption is still small, but the potential runs into millions of pounds. Prospects have brightened since the recent introduction by Reeves Bros., Inc., New York, N. Y., of a monofilament said to have greatly improved ultra-violet light resistance. Woven-rope chairs are an interesting development.

Reinforced plastics have entered the outdoor field with the introduction of a filament-wound chair molded by Winx Products, Inc., for Molla, Inc., New York, N. Y. The chair is competitive with cast-iron summer furniture.

Conclusions

In furniture, plastics have had to overcome the resistance of one of the most tradition-bound segments of American industry, often based on vested interests. But the properties of the various materials have been found ideal for many applications . . . and the price is right. Now that furniture designers see the advantages of plastics, major volume advances can be anticipated.—END

Bread wrap

(*From pp.* 118-119)

point he made is that film clarity is a property which is not intermediate between low and high density, but which actually reaches its zenith in the medium-density range.

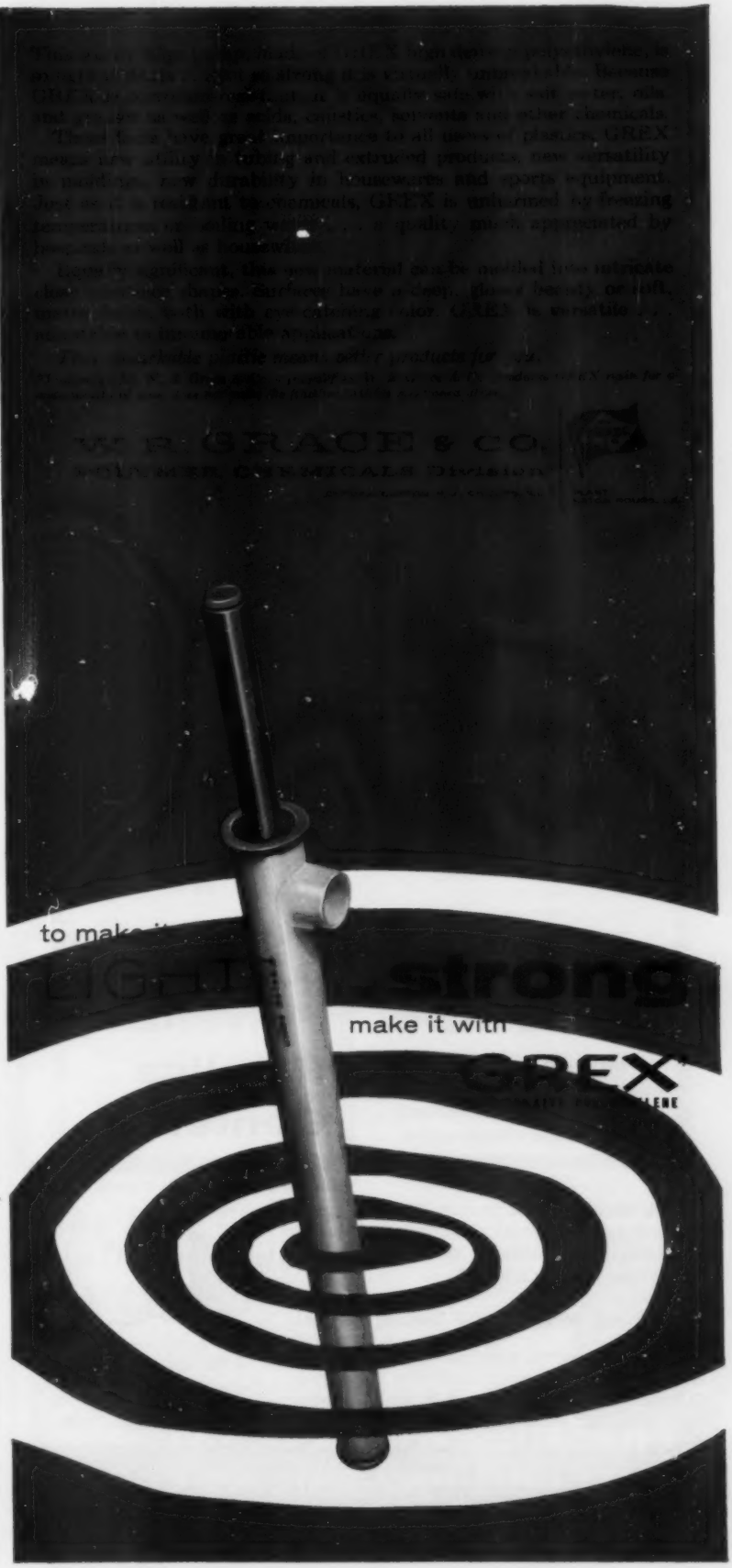
Of course, many other factors are involved in these property variations, depending on the methods employed by each resin manufacturer and extruder.

In any case, it seems obvious that Zellerbach and Spencer have hit upon a method whereby some of the variable properties of intermediate-density polyethylene can be accumulated in one formulation. Thus the strict requirements of handling and sealing can be met on a bread-wrapping machine, overcoming the factors of cost, appearance, and performance of competitive materials.

This accomplishment is particularly important since it would indicate that the broad range of properties inherent in medium-density polyethylene can be fitted together in a variety of combinations to meet the specific requirements of a wrapping for a specific product. Thus there may be a different resin formulation and a different film for use in each of such products as cigarettes, cigars, cereals, frozen foods, meat, candy bars, and a host of products, each of which would require different degrees of clarity, water vapor transmission, gas transmission, and other properties.

Huge markets ahead

Markets for the bread wrapper itself are of huge dimensions if it receives national acceptance. Today some 60 million lb. of cellophane are said to be used for specialty bread wrappers and it certainly seems that polyethylene can easily compete on a price basis. The exact price of Crown-Seal has not been divulged, but there is lots of margin to work with in comparing cellophane and polyethylene film prices. Conventional polyethylene film in 1½ mil thickness is 9¢/lb. cheaper than cellophane even without the discounts frequently allowed for large-volume polyethylene purchases. Crown-Seal will cost



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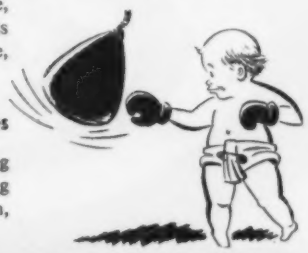

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more than conventional polyethylene because it is supposedly only one mil thick, and ordinarily costs about 3¢/lb. more than 1½ mil film. Then there is the premium price to be paid for intermediate-density resin. Even so, there should be enough margin to make it competitive with cellophane on a price basis.

Whether or not the new polyethylene film will invade the waxed paper bread wrapper market is still undetermined. Nearly 280 million lb. of waxed paper were consumed by the bread market in 1957. Standard 1.5 mil polyethylene film is priced close to waxed paper at a present cost of about 2.7¢/1000 sq. in. of film compared with 2.0¢ for waxed paper in the bread-wrapping weight (39 lb.). The higher density resin will widen this margin but increased production could eventually narrow the price differential.

For other than bread

There is as yet no indication of how the new polyethylene film will fit in as a wrapper for bakery goods other than bread. Polymer coated cellophane has moved rapidly into that field and even though it sells at 79¢ lb. compared to MSA cellophane at 69¢, it is desirable because of its superior barrier and grease-resistant properties. From a properties point of view, the intermediate-density film is said to be in between MSA cellophane and polymer coated cellophane.

But, as already indicated, there are many other possibilities where polyethylene can move in if the wrapping problems are definitely overcome. Last year, for example, it was estimated by a reliable authority that the candy market required 42 million lb. of cellophane, cigarettes took 20 or 25 million, cigars used up 15 million, refrigerated foods used 25 million, dairy products required 12 million. Obviously, polyethylene is not expected to take over entirely in these fields, but even 20 or 25%, plus a preponderant share of the bread market, could mean that polyethylene film could easily go over 100 million lb. annually for wrapping purposes in the foreseeable future.—END

Automatic plant

(*From pp. 120–124*)

the mold, stripper sleeves inside the core section of the mold are pushed forward to eject the molded cores so that they fall into the collection pan. Since sprue and runners are ejected ahead of the cores, any potential gate protrusions are removed with the sprue and runners. Details of the back plate of this mold are shown in Fig. 8, p. 123.

Protection of molds

When molds are designed for fully automatic operation, they must be adequately protected against closing on "hung-up" moldings. A device called a "tension indicator," sketched in Fig. 9, p. 123, protects our molds from excessive closing pressures. This consists of a stationary rod that lies in a drilled hole that runs the total length of the tie bar. Any difference in stretch between the unstressed inner rod and the stressed tie rod causes the pivoted lever to actuate a Microswitch, thereby opening an electrical circuit to reverse the machine closing action. Mold-closing action is stopped as in low-pressure closing, by reversing the direction of fluid flow to catch the mold in the act of closing and arrest movement of the slide plates before they reach full closing pressure. The mold slide plates will open before the pressure exceeds 1000 p.s.i., when any abnormal stress is picked up by the tension indicator.

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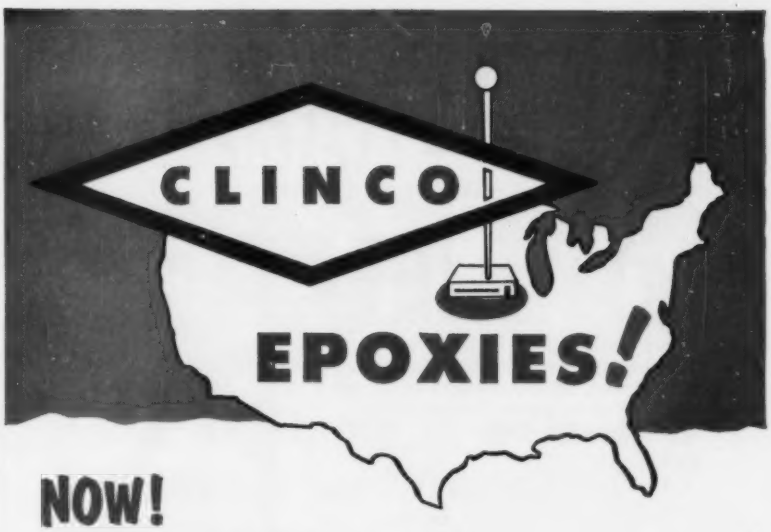
A group of standard injection



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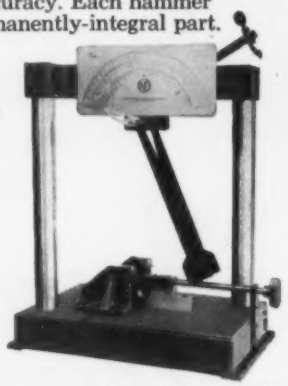

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molding machines can be tied together by means of conveyors, hoppers, and regranulators on a full automatic cycle to deliver molded elements to centralized workplaces. With special-purpose machines, on the other hand, such "tie-ins" are not feasible because of heavy tooling costs and the long time needed to develop special fixtures and other tools.

Material supply

There must be a reliable supply of both virgin and regranulated molding materials to each molding machine. As indicated in Fig. 6, regranulated runners are collected in drums. Periodically, a floor handler empties the drums of reground runners into the hoppers where they mix with the virgin pellets.

High-lift fork trucks bring in drums of virgin pellets on a regular schedule. To insure uninterrupted full automatic operation of the molding machines, delivery schedules for both virgin and regranulated materials must be adhered to rather closely.

The proportion of virgin pellets to regranulated molding material is worked out to suit the individual molding characteristics of the job. In cases where the percentage of virgin to regranulated must be higher than it would be if the reground were all returned to the machine, drums of reground are diverted elsewhere and mixed with virgin as required. Mixing schedules need to be sufficiently flexible to meet individual conditions of the molding job.

Low-pressure air conveys the molding powders (both regranulated and virgin) from the hoppers to the predryers (Fig. 10, p. 124) of the molding machines. In some instances, we use a high-pressure system for feeding molding materials directly from drums. In high-pressure feeding, the intake tube is screwed into the pile of pellets and, by means of a Venturi, the air aspirates the pellets through delivery piping into the predryer.

Quality control

Quality control measures are especially important for fully automatic operation because unde-

tected deviations from quality standards can lead to considerable scrap loss and re-work. At predetermined regular intervals, quality control inspectors patrol the injection molding area and sample parts from the machines as in Fig. 11, p. 124. If too many defectives are found, the inspector informs his supervisor and the parts are segregated for a separate 100% inspection.

Whenever parts fail to meet quality standards, the machine is temporarily shut down until the source of the trouble has been identified and the necessary corrections initiated. The results of each check are recorded on a performance chart, which is located near the machine.

Cleanliness and safety

Nothing hinders area cleanliness as much as oil spillage. The method which we have found practical and economical to prevent spillage is shown in Fig. 12, p. 124. The molding machines are mounted on metal-cased cork isolators, and a shallow angle drip pan is placed under the machines to collect the excess oil before it can reach the floor.

A visiting maintenance man periodically uses a special vacuum cleaner to clean oil and to remove particles of plastic from the pan. At the same time, this man is also required to clean the floor around and adjacent to the machine.

The photographic views with this article show many types of machine-guarding and the safety-interlock switches used to protect personnel and equipment. Safety to personnel is further enhanced by locating the man at a centralized workplace between the machines. Through this arrangement, the opportunity for contact between the men and the machines during the molding cycle is virtually eliminated, and the hazard of a serious accident is reduced even further.

We cannot emphasize too much the importance of engineering the set-up to meet the individual production requirements of a part. Only through thorough engineering can the full advantage of automatic cycling for injection molding be realized.—END

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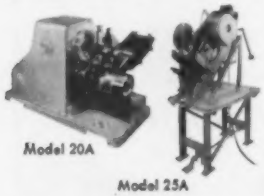

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Dinnerware

(*From pp.* 126-127)

Research, Inc.,[1] which showed that the maximum temperature reached during any part of the cycle by 12 types of dishwashers tested ranged from 125 to 175° F.; only three of the machines tested reached a maximum of 165° F. or over at any time.

There has been a trend to somewhat lower maximum temperatures by dishwasher manufacturers; one factor favoring such a trend is the almost universal use of plastisol-coated racks which would be damaged by excessive heat.

Scratch resistance

Dinnerware made of Tyril is said to be slightly more subject to scratching than melamine ware, but exceptionally resistant to chipping. It is felt that scratching, which can occur with all types of dinnerware, including fine china, is becoming less of a problem as consumers grow more familiar with it and avoid the use of steak knives which may mark the surface. Guarantees accompanying the Tyril sets specifically caution against the use of sharp knives, as well as abrasives, cleaning powders, or steel wool.

Molding conditions

The Tyril 767 compound used in molding tableware is available in a range of transparent and opaque colors. Special packaging is used to hold moisture pickup to a minimum during storage, because the molding material absorbs more moisture than general-purpose styrene.

Injection molding conditions for Tyril 767 depend upon the particular machine used and the geometry of the part to be produced. The normal range of cylinder temperatures is approximately 400 to 550° F., or 50 to 75° higher than for general-purpose styrene employing comparable machine pressures. Controlled mold temperature is an important consideration. According to Dow, if mold temperatures in the region of 170 to 190° F. or higher are used, the moldings will exhibit maximum heat resistance.—END

[1] "Automatic dishwashing machines," Consumer Bulletin, p. 13, Feb. 1958.

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Miniature mixer

(*From p. 140*)

seal ring, and it retains heat when the machine is idle and the pestle is elevated and exposed to the air. A number of materials were tried as seal rings—nylon, marine bearing wood, and various laminates. TFE resin was by far the best, but even this material abrades gradually and can cause cloudiness in transparent samples that are mixed for 10 min. or more.

Figure 2, p. 140, is a photo of the RMM, complete with air cylinder. This design is not considered final. Various fins, threads, and protrusions can be built into the chamber to increase mastication. A TFE bearing disk can be placed to occupy the point of no shear, though this slows plastication.

After a period of warm-up, a granular charge of about 12 to 15 g. is loaded into the mortar, the seal ring is inserted, the pestle is lowered, and rotation commenced. The cold plastic starts to fuse between the two bottom surfaces, but the pressure soon forces the softer material up into the cylindrical clearance. Pestle temperature is maintained 20 to 30° F. higher than that of the mortar so that the finished mix will adhere to the pestle surface when the RMM is opened (Fig. 3, left). The molten mass is easily removed from the pestle with a brass stripping tool.

Fig. 3: After mixing, hot compound is removed from pestle with stripping tool

Since there is a point of no shear at the center of the bottom, it is our practice to raise the pestle after 2 min. to re-position the charge and then mixing it for another 2 minutes. At the end of the mixing cycle, the plastic mass is transferred to polished plates, between which it is compression molded to standard thickness.

It has been possible to predict with high accuracy the final color of an extruded lot of 50 to 100 lb. of a compound from the results obtained with the RMM. The Miniature Mixer has also been useful in making up small amounts of masterbatch concentrate, for preparing small samples for physical testing from flake or molding powder, and for quality control of purchased colorants. All commercial thermoplastics have been successfully compounded in this machine.—END

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Plasticizers

(*From pp.* 142-152)

sion temperature with plasticizer concentration for many plasticizers might provide a better understanding of the mechanism of fusion and could eventually lead to the development of a value corresponding to the well-known "efficiency modulus concentration" which has gained such wide acceptance in the vinyl industry. This should permit the accurate calculation of the fusion temperature of plasticizer blends much in the same manner that the hardness or brittleness temperature of conventional vinyl compounds can now be estimated with useful accuracy (11).

Acknowledgments

The author wishes to acknowledge his thanks to his former colleagues at Barrett Div. for their helpful suggestions during the course of this work. Particular acknowledgment is due H. G. Tinger for working out the details of the fusion temperature test, R. P. Feeney for obtaining all the data reported herein, and J. L. Stark for his assistance in analyzing the data that were obtained during the study.

References

1. Modern Plastics *34*, 99 (Jan. 1957).
2. Todd, W. D., Esarove, D., and Smith, W. M., ibid, 34, 159 (Sept. 1956).
3. Doolittle, A. K., "Technology of Solvents and Plasticizers." 1954. New York: John Wiley and Sons, Inc.
4. Bergen, H. S. and Darby, J. R., Ind. Eng. Chem. 43, 2404 (1951).
5. Doolittle, A. K., ibid, 38, 535 (1946).
6. Barrett Div. Technical Release, "Plasticizers in plastisols-viscosity characteristics."
7. Doolittle, A. K., J. Polymer Sci. 2, 121 (1947).
8. Walter, A. T., ibid, 13, 207 (1954).
9. Doty, P. and Zable, H., ibid, 1, 90 (1946).
10. Burrell, H., Official Digest 27, (No. 369), 726 (1955).
11. Wartman, L. H., Modern Plastics *32*, 139 (Feb. 1955).

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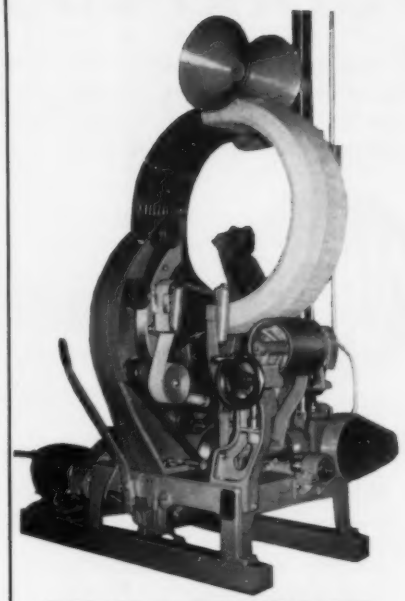

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RP at high temp.

(*From pp.* 155-166)

forcement appears to be a somewhat different problem, since the relative performance of compositions containing different fibers depends markedly on the nature of the exposure. At the lower temperatures, near 5400° F., glass reinforcements, for example, "sweat" out of the compositions and coat the model.

Thus, the higher viscosity of high-silica glasses makes them more resistant to being swept away as large droplets, and thus they increase the thermal efficiency of the process. At the extreme temperature in the arc plasma, however, the performance of high- and low-silica fibers is not distinguishable, and is improved as the organic content of the composition is increased. It should be noted also that the organic fibers have much lower thermal conductivity than the glass fibers, thus making possible the generation of higher surface temperatures which could lead to a closer approach to thermal equilibrium with the gases of the environment, and also increase re-radiation to these gases.

Other materials

Reinforced epoxy resins: These materials have not to date shown particular promise, except in a single instance. In this work, however, there has been no particular effort to develop the optimum epoxy resin-hardener-catalyst system.

Asbestos - reinforced plastics: These materials have generally performed poorly in many cases. It is conceivable that the choice of resin or postcure conditions was not optimum. It is also possible that the water contained in the asbestos fiber acts to destroy the compound by "explosion" at these extreme temperatures, thus causing spalling.

Phenolic resin filled with a graded magnesium oxide: This material gave fairly good performance. Here the question of whether a non-fibrous filler can be useful has some vitality. Certainly such a filler will not contribute as much to the mechanical properties. Furthermore, a spherical, high thermal conductivity inclusion in the resin might easily generate gas at the resin-particle interface and be ejected prematurely. This point has not yet been fully resolved.

Melamine resins: These resins were better when reinforced with cotton than with glass. In general, they were found to be as good as the poorer phenolic resins and about half as good as the best phenolics.

Silicone resins: Results obtained to date with various reinforcements have not shown particular promise, although some results have been closer to the better phenolics than to the poorer ones.

Hard rubber: In a single test hard rubber gave fairly good results while the same rubber filled with 60% carbon was inferior. From the theoretical point of view, this should be an interesting material. The effect of carbon may be interpreted in the

same general terms as the effect of magnesium oxide previously discussed.

Materials after test

While weight loss is the ultimate criterion for selecting materials for high temperature service from among those that have adequate mechanical properties, other observations can be useful for understanding the process and developing new compositions. In particular, sections of the models after testing have been examined. The sections are made by sawing in a plane perpendicular to the heated face. Mounting and polishing follows the usual metallographic techniques.

The best performing substances such as the reinforced phenolics, melamines, and silicones present drastically altered surfaces after test. The mounted sections permit observations of the depth and nature of the damage.

The depth of the damage depends on both the material and the test. Glass-reinforced materials are damaged to a greater depth than organic-fiber-reinforced materials, reflecting the higher thermal conductivity of the glass. As the temperature of the test is increased, the depth of damage decreases. This result is probably due to the relatively greater stability of the degraded surface at the lower temperatures. A steady state of damage appears to develop; that is, although the exposed surface recedes, the thickness of the damaged layer remains constant. It is likely, therefore, that a steady state will also develop in the gas phase.

Furthermore—and this is important from a structural point of view—except for the thin surface layer, the material that remains at any particular time can be expected to have its original low temperature mechanical properties.

Study of the sections also shows that for high performance materials, the separation between the damaged and undamaged layers is sharp and well defined. Specimens that show poorer performance also often show poorly defined separations. It appears that local regions of thermal degradation occur in otherwise sound material and cause premature general failure. This observation suggests that one key to high performance is uniformity and freedom from impurities.

The authors wish to express their appreciation to Mr. L. R. McCreight, Dr. J. McGinn, Dr. H. Wachman, Mr. J. Metzger, Mr. G. Cherniak and Dr. W. Sheridan, who provided much of the data and information upon which this paper is based.

References

1. Von Karman, T., "Aerodynamic heating—the temperature barrier in aeronautics." See reference 2, pp. 140-142.

2. Proceedings of the Symposium on "High temperature—a tool for the future," Stanford Research Institute, University of California, June, 1956.

3. Maecker, H., Z. Physik *129*, 108-122 (1951).

4. Weiss, R., Z. Physik *138*, 170-182 (1954).

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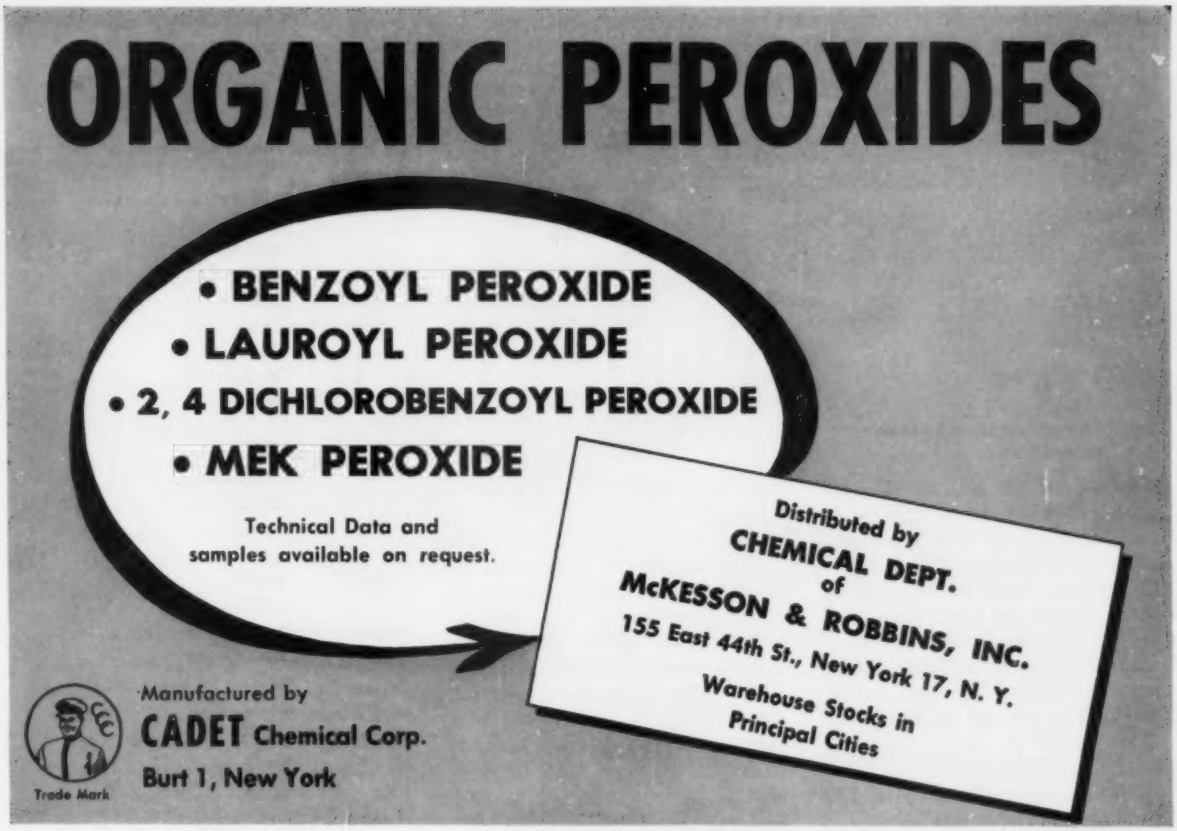

Epoxy resins

(*From pp.* 172-176)

uation suggest themselves immediately. Filling the adhesive with material that would improve its thermal properties, e.g., metal powder or filaments, would decrease the transient thermal stress for a given cooling or heating rate. The electrical properties may be correspondingly changed by improving the thermal properties, however, and this must be considered if high dielectric strength is a requirement. Likewise, thinner glue lines are preferable to thick ones when a choice is possible.

Epstein (3) mentions that the strength of adhesives that do not liberate gases during cure show little dependence upon glue-line thickness. He states, however, that thickness should not exceed 10 mils for optimum strength. Figure 6, p. 176, shows strength versus thickness at 300° K. of bonds that received no treatment other than the usual curing cycle prior to test. The slight curvatures are probably better attributed to experimental error than to any real effect.

Conclusions

1) The impact strength of the bulk adhesive is low at room temperature and decreases to a very low value at 76° K. It displays increasing brittleness and notch sensitivity with decreasing temperature.

2) Temperatures above the cure temperature cause damage to epoxy resin adhesive bonds and result in decreased tensile and shear strength. In particular, epoxy resins polymerized with diethylaminopropylamine are seriously harmed by temperatures of 398° K. (125° C.) and higher.

3) Rapid thermal cycling between 76° K. and room temperature prior to testing at room temperature results in decreased shear strength of these adhesive bonds while the tensile strength is affected only slightly.

4) Bonds tested at 20° K. and 76° K. (again cooled rapidly) displayed roughly the same tensile strength as at room temperature, but showed a considerable decrease in shear strength at the low temperatures. There is no significant change in shear strength between 76 and 20° K.

5) Given a strong adhesive bond at room temperature, the match between thermal expansion of adhesive and adherend is a good criterion of its strength at low temperatures.

6) Thickness of the adhesive bond was found to have no effect on strength between 10 and 30 mils.

References

1. G. W. Koehn, "Behavior of adhesives in strength testing," chapter in "Adhesion and adhesives, fundamentals and practice," p. 120 (John Wiley and Sons, Inc., New York, N. Y., 1954).

2. N. A. de Bruyne, "The adhesive properties of epoxy resins," J. Appl. Chem. *6*, 303 (1956).

3. G. Epstein, "Adhesive bonding of metals" (Reinhold Publishing Corp., New York, N. Y., 1954).

The Plastiscope

News and interpretations of the news
By R. L. Van Boskirk

Section 2 (*Section 1 starts on p. 39*)

High-density polyethylene containers

Commercial production of rigid containers made from high-density polyethylene has been announced by Owens-Illinois Glass Co. Special machines for making these containers were developed by the company and are being manufactured at its Alton, Ill., machine shop. Although initial production will be at the firm's Glassboro, N. J., plant, O-I plans to install machines for making the containers at its St. Charles, Ill., plastics plant later this year.

Initially, bottles in capacities from 12 to 32 oz. will be produced. Manufacturers of household and chemical items, such as detergents, waxes, polishes, and related products, are expected to be the first to use the new containers.

O-I research indicates that its new plastic bottle will not presently be used for packaging beer, carbonated beverages, whiskey, perfumes, and solvent base products such as kerosene, motor oil, charcoal lighter fluid, and oil base paints. Tests with food products also have shown that the present plastics material offers some problems which raw material suppliers are working to overcome.

Carl R. Megowen, president of the company, stated that "the company is convinced that the new container will take to market many new products that cannot be properly marketed now for lack of a satisfactory package."

Mr. Megowen also seems convinced that use of glass containers will continue to grow even though the field is heavily invaded by polyethylene. He pointed out that glass bottles and jars will continue to double production every 15 years. He added that by 1975 the nation's glass container companies should be producing at least 46 billion bottles and jars—more than twice the record-breaking 20 billion glass containers produced in 1957.

An estimate on the growth of polyethylene in bottles, jars, and tubes, published in MODERN PLASTICS, January 1958, showed 18 million lb. consumed in 1957 and predicted a 50 million-lb. consumption for 1960.

*Reg. U.S. Pat. Off.

New phenolic resins

Four new phenolic resins developed to cut production costs in the insulation, wood-waste products, and molding fields have been announced by Reichhold Chemicals, Inc., White Plains, N. Y.

Two of the resins, Plyophen 5675 and 5928, were developed primarily for the economical production of rock-wool and fibrous glass insulation. They are said to be highly heat resistant and water-soluble.

Plyophen 5675 is described as a low-viscosity, substantially undehydrated resin which can be pumped and cooled more easily than high-solids resins currently used in insulation manufacture. According to RCI, it can also be produced with greater uniformity and condensation than dehydrated high-solids resins. Plyophen 5928 is slightly modified so that the batts of insulation will be more resilient and there will be less build-up of resin on the sides of the forming container.

The other pair of phenolics, Plyophen 5833 and 5916, are finely powdered, two-step resins which produce fast-curing wood-waste molding and true molding compounds with medium or short flow. These resins are claimed to produce general-purpose molding materials with excellent electrical, mechanical, and water-resistant properties and fast-curing cycles.

The company will urge large users to make their own phenolic molding compounds with RCI technical assistance and resins. According to RCI, this is economical for any manufacturer who uses more than 50,000 lb. per month. Because of a resulting savings of at least 5¢/lb., production equipment, which would cost about $60,000, could be paid for in about two years, RCI figures indicate.

Japan's first ethylene plants

Two major ethylene plants in Japan, designed by Stone & Webster Engineering Corp., 90 Broad St., New York, N. Y., have gone on stream. One is a 20,000-metric tons/year unit for Mitsui Petrochemical Industries, Ltd., located at Iwakuni City near Hiroshima. The plant obtains its feed stock from a nearby refinery and uses some of it for making polyethylene by the Ziegler process. The other, a 12,000-metric tons/year unit for Sumitomo Chemical Co., Ltd., located at Niihama, is used for the production of polyethylene by the Imperial Chemical Industries, Ltd. high-pressure process.

These two new plants will no doubt have a great effect on Japanese imports of polyethylene, which amounted to over 35 million lb. in 1957.

A phenol and acetone plant, which Stone & Webster also designed for Mitsui Petrochemical, is expected to go on stream at Iwakuni City shortly.

Color trend forecasts

Predictions of what colors will be popular with consumers six to 12 months from now are being added to other services which Du Pont extends to designers and manufacturers of plastics products. The new service, made available through a recent agreement between Du Pont's Polychemicals

we're in ORBIT and being tracked!

WHY ?

We manufacture the largest and most complete line of Polyester Resins in the entire world.

We assist in development of new products for firms who wish to diversify into F R P.

We are years ahead in color research, Gel-cote development, design, and intelligent approach to end-use problems.

Take advantage of

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No obligation is incurred by consulting with our expert staff

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American Petrochemical Corporation
Minneapolis 18, Minnesota U.S.A.

The Plastiscope

Dept. and color consultant Faber Birren, is based on research into the long-term patterns of public acceptance or rejection of colors. The company plans to integrate knowledge of shifting public preferences into its present facilities for styling, engineering, and testing at its sales service laboratory near Wilmington, Del.

This combined service is expected to enable Du Pont's customers to improve sales appeal of new product designs, reduce the risk of speculation in color choice, and forestall the buildup of finished product inventories in slow-moving colors.

The company will obtain Mr. Birren's exclusive interpretation of color trends for applications in nylon and acrylic resins. He will also advise on colors for Du Pont's new Delrin acetal resin, which is expected to be available in mid-1959.

Dow makes allyl alcohol

The Texas Div. of The Dow Chemical Co. has started volume production of allyl alcohol, a highly reactive material used extensively as a chemical intermediate in the manufacture of resins, pharmaceuticals, etc. It functions primarily as an intermediate for such esters as allyl isothiocyanate, diallyl phthalate, allyl caproate, and allyl methacrylate.

Since it contains both a double bond and a primary hydroxyl group, allyl alcohol will react both as an olefin and as a primary alcohol. Reactions may occur at the unsaturated linkage or with the hydroxyl group.

As produced by Dow, allyl alcohol has a minimum assay of 98 percent.

Release paper

Especially difficult releasing problems encountered in the production and utilization of products having tacky surfaces can reportedly be overcome with a release paper introduced by Daubert Chemical Co., 333 N. Michigan Ave., Chicago 1, Ill.

The chemically-treated paper has found use as a backing for pressure-sensitive adhesive coated plastics, fabrics, paper, rubber, etc. It also performs a useful function in the production of foamed products or sponge. The material is available with one or both sides coated.

All-plastic ball valve

A relatively inexpensive rigid Koroseal PVC self-lubricating ball valve with Teflon seals has been announced by the Plastics Div. of B. F. Goodrich Industrial Products Co., Marietta, Ohio.

The product is said to be lighter in weight and more compact than other PVC valves, and the ball valve provides easy take-up to compensate for wear. Replacement parts are reported to be easy to install.

The quick-opening valve has no metal parts and is said to have chemical resistance equal to high-impact rigid Koroseal Grade 300. Recommended working pressures for sizes ½ through 1½ in. are: 140 p.s.i. at 100° F.; 70 p.s.i. at 130° F.; and for 2- and 3-in. sizes, 100 p.s.i. at 100° F. and 50 p.s.i. at 130° F.

Heat-resistant pigments

Two organic reds of the pyrazolone type for use in plastics and rubber have been added to the Plasticone line of pigments manufactured by the Pigment, Color and Chemical Div., Sherwin-Williams Co., 260 Madison Ave., New York 16, N. Y. They are Plasticone Red Light 10465, a very opaque, bright, light-shade pigment, and Plasticone Red Medium 10464, a medium-shade pigment of medium opacity and brightness.

The pyrazolones as a class are said to have bright shades, be non-bleeding, have good light resistance in full shades, and provide heat resistance superior to most red pigments. According to the company, the Plasticones are completely insoluble in plasticizers, do not crock when used with common plasticizers, and do not migrate into white stocks. These properties, plus good resistance to alkalies, soap, and detergents, make them suitable for use in vinyls, polyethylene, polyester, and rubber. A particularly appropriate use may be in floor tile.

Colt's Plastics Co. sold

A Rhode Island group headed by the Salmanson family, owners of the Adams Drug Store Chain, has acquired the assets of Colt's Plastics Co., Inc., N. Grosvenorsdale, Conn., from Penn-Texas Corp., New York, N. Y., the parent company.

A Connecticut corporation has been set up to operate the company under the same name. Colt's is a custom molder employing about 150 persons. Annual sales are reported to amount to about $2 million.

Licenses injection molding process

Rights to manufacture unplasticized polyvinyl chloride products by the Hendry injection molding process have been granted to BTR Industries, Ltd., London, England, by Tube Turns Plastics, Inc., Louisville, Ky. The license agreement provides for rights to the process, furnishing of equipment, and technical counsel.

BTR Industries, with 10 factories in Great Britain, is a major manufacturer of plastic and rubber products and engages extensively in international trade. Tube Turns, an affiliate of National Cylinder Gas Co. and Jackson & Church Co., manufactures injection molded unplasticized PVC fittings and valves for industrial and commercial piping systems, as well as custom molded products.

Plastics in California

A new and enlarged plant was recently opened by Wilson & Geo. Meyer & Co. and its affiliate, Wilson Meyer Co., sales representatives for Eastman Chemical Products, Inc. in the Pacific Coast regions of the United States and Canada. At the opening, William S. Vaughn, president of Eastman

(*To page* 245)

U.S.I. POLYETHYLENE NEWS

A series for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

Packaging Notes

New Surface Treatment for Polyethylene uses fluorine to make poly bottles and containers substantially impermeable to gases and volatile chemicals. The fluorination process, described in a recent patent, may make possible polyethylene packaging of such items as liquid cosmetics, aromatic solvents, oils and aerosol formulations.

The fluorination process is claimed to be simple and economical. Film or bottles, washed free of foreign matter, are brought in contact with pure fluorine or a fluorine gas mixture at room temperature or at up to 50°C. In a typical test, loss of a volatile liquid was claimed to be reduced from 5.67% in an untreated bottle to .05% in a fluorinated bottle over the same period of time. In another test, treated film transferred less than a sixth as much oxygen as untreated film. Other properties of polyethylene are said to be unchanged by the process.

Tear Tape Opening for polyethylene coated package is being used by one manufacturer. Product is packaged in a poly-coated aluminum foil pouch with a 3-lb. cotton thread applied as part of the extruded poly coating. It is believed that this method may be used with equal success on packages of unsupported polyethylene film.

Two New Appointments Announced by U.S.I.

John K. Moffett, Jr.

William H. Rader

John K. Moffett, Jr. has been appointed Assistant Manager of PETROTHENE® Polyethylene Sales. Mr. Moffett has been employed by U.S.I. since 1948 in various production and sales capacities, and has served recently in a sales development position for PETROTHENE resins.

William H. Rader has been made Assistant Production Manager for PETROTHENE resins. As Senior Development Engineer Mr. Rader has been in charge of polyethylene development operations at U.S.I's Tuscola plant.

Film Can Be Drawn Down To Less Than 1/4 Mil With New Medium Density Petrothene® Resin

Provides Added Safety Margin at Commercial Film Thicknesses

Super-thin (0.2 mil) blown film of PETROTHENE 239-27 is so light it virtually floats in air.

U.S.I. has introduced a new medium density polyethylene resin that makes possible extrusion of film in thicknesses as low as 0.2 mil. While few commercial uses exist for film of this gauge, the new resin offers a greater margin of flexibility during extrusion at conventional thicknesses such as 0.4-0.5 mil.

The new resin, called PETROTHENE 239-27, has a density of 0.929, placing it in the medium density polyethylene range. Film made from it has increased stiffness, with excellent gloss and clarity. This high clarity, and the ease with which low thickness film can be extruded, is expected to make the resin of particular value in thin film applications such as drycleaner garment bags.

Stiffness Makes for Easier Handling

The new resin brings an added advantage to the manufacture of garment bags:

Film extruded from it has a high degree of stiffness and has less tendency to cling to garments. In soft goods packaging, this added stiffness makes for easier handling on the packaging line. Packages and bags made with the lighter gauge film are also easier to tear open.

Extruders may obtain specifications and other technical data on PETROTHENE 239-27 resin by writing to PETROTHENE Polyethylene Dept., U. S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.

Group Begins Second Year Of Plastic Pipe Promotion

The Plastic Pipe Research Council recently outlined the second-year plan for its NSF (National Sanitation Foundation) plastic pipe program.

Cornerstone of the Council's promotion is a research and information program which includes producing slide films, placing informative articles in leading consumer and industrial publications and a brochure entitled, "Safe Transportation of Drinking Water — Your Key to Public Health." The promotional campaign is aimed at persons and organizations who buy, specify or permit the use of plastic pipe approved for transmission of drinking water. It is supported by a group of pipe manufacturers and raw materials suppliers, including U.S.I.

Booklet on Resin Quality in Housewares is Offered

A 24-page illustrated booklet containing tips for plastic housewares buyers is now available from U.S.I. The booklet, "The Goose That Laid the Golden Egg," emphasizes the importance of resin quality and good production practices in maintaining the market for polyethylene housewares. It points out what guides to judging quality are available to the buyer. Copies of the booklet are available to polyethylene molders for distribution to their customers. Write Editor, U.S.I. POLYETHYLENE NEWS, 99 Park Avenue, New York 16, N. Y.

Extrusion Coaters Report Large Increase In Facilities

The number of extrusion coating machines in the U. S. has risen to approximately 45, according to a recent report by the Polyethylene Extrusion Coaters Group of the Specialty Paper and Board Affiliates.

The large increase over the number of facilities available three or four years ago can be attributed to rapid growth of uses for polyethylene coated paper, board, film and foil in the food, dairy and industrial packaging industries, and increasing consumer acceptance of polyethylene coated containers.

IN THIS ISSUE:

P. 2 — High Clarity Film

P. 3 — How to Avoid Wrinkling in Blown Tubing

P. 4 — Contest Anyone Here Film Market

VISIBILITY UNLIMITED

● Blown film from regular production run using a PETROTHENE Polyethylene resin. Film is 1 mil thick—Other films may be drawn down to as low as 0.2 mil.

. . . and Clarity is only one of the advantages offered by PETROTHENE® Resins - -

PETROTHENE polyethylene resins permit you to offer your customers film with the characteristic toughness of polyethylene, plus clarity and gloss in the same range as conventional transparent packaging materials. And at the traditionally low cost of ordinary polyethylene, PETROTHENE resins give you these extra advantages:

Improved Toughness/Clarity Ratio

As you know, the more toughness you require in polyethylene film, the less clarity you can expect. With clear PETROTHENE resins, however, you get a more favorable toughness/clarity ratio than with ordinary polyethylenes. For example, at the same level of toughness, PETROTHENE resins offer a higher degree of clarity; at equal clarity, PETROTHENE resins have more toughness. In addition, PETROTHENE resins offer you a complete range of variations in toughness and clarity to suit any end use your customers specify.

Unusually Good Draw-down

You can draw some PETROTHENE resins down to 0.2 mil. While few commercial applications require gauges as thin as this, the figure indicates the margin of safety which PETROTHENE resins give you at conventional thicknesses. PETROTHENE resins can also be extruded into thicker film or sheet.

Hold up a film made from U.S.I. PETROTHENE polyethylene and look at any distant object through it. Then do the same with any other polyethylene film of similar thickness. This simple test will demonstrate the outstanding transparency of film made from PETROTHENE polyethylene resins.

U.S.I. technical representatives will be glad to work with you to obtain the best possible film properties and production rates with PETROTHENE resins. For sample or information on PETROTHENE resins, write to:

USI INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities

U.S.I.

Vol. III No. 3

POLYETHYLENE PROCESSING TIPS

HOW TO AVOID WRINKLING IN EXTRUSION OF BLOWN TUBING

Wrinkles in blown polyethylene tubing on the windup roll is a problem that plagues even the most experienced extruders. It occurs intermittently in almost every shop, and may usually be avoided by one or more of the following measures.

Die Adjustment

Be sure the die opening is adjusted properly. If it is out of alignment, it can cause gauge variations which result in an uneven pull at the nip rolls and subsequent wrinkling on the windup. Uneven or thin gauge at the sides of the ascending tube may show as chevron-type wrinkles on the edge of the roll.

The improper adjustment of the die opening or orifice, or a frost line which is not level, may cause a condition known as bias – a greater or smaller distance around one half of the tube than around the other half – and results in a surplus of film to the front or rear on the windup. Ruffle-like wrinkles across the center of the lay flat width are characteristic of a bias condition.

Film Temperature Control

If the frost line is too high the blown tube is difficult to control and may cause poor gauge control around the circumference of the tube and uneven gauge in the film. This in turn could lead to an unbalanced pull in the nip rolls or across the collapsing guides and result in wrinkling. The frost line can be lowered by slowing down the rate of extrusion, reducing melt temperature or increasing cooling.

If the film is too cold when it reaches the nip rolls, it may be overly stiff and subject to crimping. The temperature may be increased by increasing the screw speed, lowering the height of the rolls or stepping up the extrusion and take-off rates. Temperature increases must be made cautiously, though, to avoid blocking of the film.

Adjustment of Guides and Rollers

The ascending tube may wobble from side to side due to extruder surging or rapidly moving air currents in the shop. It is recommended that the tube be supported by horizontal stationary guides at two or three places during its ascent.

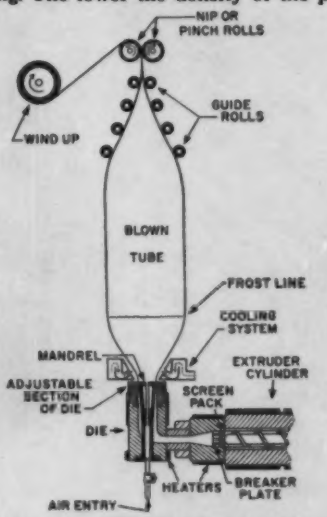
Slight eccentricities in alignment of the nip rolls may be the underlying cause of wrinkles. These rolls must be parallel to insure uniformity of pressure. It is recommended that the rear nip roll be fitted with small hydraulic cylinders to provide positive pressure across the entire width of the nip rolls.

Wrinkling may also occur if the collapsing guides or rollers are not properly aligned with the nip rolls. Many commercial windups contain adjusting knobs for shifting the front to rear position of the collapsing rollers slightly.

Considerations of Gauge, Width, Resin Density

Wrinkling is more prevalent at low gauge and high take-off rates, and precise gauge control becomes even more important. At film gauges below one mil extremely close control of the above factors must be maintained to avoid wrinkles.

Narrow tubing has less tendency to wrinkle than wide tubing. The lower the density of the polyethylene resin used to make the blown tubing, the less susceptible it is to wrinkling because it has more flexibility – will conform more readily to a flat shape.



Technical Help from U.S.I.

As you can see, wrinkling of blown tubing is a problem with many possible causes and solutions. U.S.I. technical service engineers have worked closely with many extruders in tracking down sources of difficulty and suggesting preventive measures. They would be pleased to work with you on this or any other processing problem.

U.S.I. manufactures a variety of film-grade resins meeting the highest and most diverse specifications for clarity, gloss, toughness, stiffness and slip. We would be glad to work with you in determining which PETROTHENE® resin best fits your needs.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N.Y.
Branches in principal cities

DRY CLEANERS' GARMENT BAGS

fastest growing new film market

Polyethylene bags for dry cleaned garments are almost competitive in price with old-style paper bags. The obvious consumer advantages of polyethylene film for garment bags and laundered shirt packaging — "see through" clarity, toughness, reusability — are making this application the extruder's fastest growing new market for polyethylene film.

In making film for the garment bag and laundry market, look for these special advantages of U.S.I. PETROTHENE® 239-27 polyethylene resin:

Better Film Appearance — PETROTHENE 239-27 polyethylene resin gives you films with unusual clarity and gloss at all gauges. Stiffness is also superior.

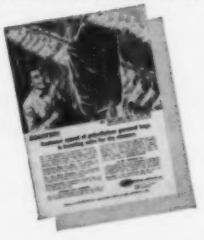
Excellent Drawdown Properties — PETROTHENE 239-27 polyethylene resin gives you up to 30% faster production. Film can be drawn down to as low as 2/10 mil which means better control at thicker gauges.

Wide Resin Choice—You can also choose from a broad line of other PETROTHENE polyethylene resins —select the one that suits exactly the production requirements for the type of film you produce.

WRITE FOR FREE BOOKLET. U.S.I. maintains an extensive research and technical service program to help you with your film extrusion problems. Presently available in booklet form is "Heat Seal Characteristics of Polyethylene Film," a discussion of heat sealing problems of particular interest to polyethylene garment bag makers. For a free copy of this 16-page, illustrated booklet, write to U. S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.

U.S.I. IS HELPING EXPAND YOUR POLYETHYLENE FILM MARKET WITH ADS LIKE THIS—

The advantages of polyethylene film for garment bags and laundered shirt packaging are being pointed out to the dry cleaning and laundry industries in a series of ads such as the one at right. These ads are designed to pre-sell your potential customers on the sales appeal of polyethylene film packaging. To receive reprints of these ads as they appear, write:



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The Plastiscope

Chemical, stated that "21 years ago, when Wilson & Geo. Meyer & Co. was appointed sales representative for Eastman Tenite plastics, there was not a single injection molding machine on the West Coast. Today, it is estimated that there are over 700 machines of this type in California alone." Referring to the rapid growth of the thermoplastic molding industry, Mr. Vaughn pointed out that sales of Eastman plastics on the West Coast have increased two and one-half times in the past five years.

The new $500,000 plant at 2060 S. Garfield Ave., Los Angeles, Calif., doubles the Meyer firms' former southern California office, warehouse, and storage space. Four 15,000-gal. underground tanks and one 6000-gal. surface tank for blending certain plasticizers comprise the new bulk storage facility.

Stabilized polyethylene filaments

A process claimed to stabilize polyethylene filaments against degradation in sunlight and high temperature in outdoor uses has been developed by Reeves Brothers, Inc., 54 Worth St., New York 13, N. Y. Special procedures, involving the use of selected, well dispersed pigments, are reported to impart to the fibers ultra-violet absorbing, anti-oxidant, and anti-cracking properties.

The process is also said to improve the hand and elasticity of the fibers and fabrics made from them. Designated Reevon polyethylene filaments, the company's stabilized materials are available in a wide range of colors, including the bright shades.

Non-silicone release agent

A non-melting, non-toxic parting agent, designated Resin Release N, which contains neither silicone nor wax, has been developed by Specialty Products Co., 192 Warren St., Jersey City 2, N. J., for use in releasing plastics parts from compression, injection, and casting molds, or patterns.

The company states that the agent will not change viscosity or deteriorate up to 450° F. It is water-repellent and is unaffected by residual moisture or moisture released by resin reactions. Release problems involving polyester, epoxy, phenolic, silicone, Neoprene, isocyanate, urea, melamine, alkyd, and vinyl resins are said to have been solved successfully.

Resin Release N is soluble in toluene, xylene, and related hydrocarbons which can be used to make a spray solution or dilute wipe-on film.

New molding company

Tonka Plastics, Inc., 345 Water St., Excelsior, Minn., is a new entrant in the custom injection molding field. The company is equipped with 2½-oz. automatic injection molding machines and will specialize in producing small parts of nylon, acrylics, butyrate, styrene, polyethylene, and other materials.

Morris Rosen is president; Thomas McKinney, vice president and general manager; and Ronald H. Johnston, sales manager.

Equipment producers join forces

A five-year, cross-licensing agreement has been concluded between National Research Corp., Cambridge, Mass., and Leybold-Hochvakuum-Anlagen, G.m.b.H., Cologne, Germany, two leading high vacuum equipment producers.

The agreement was made on behalf of NRC Equipment Corp., a wholly-owned subsidiary of National Research. Combined German and American developments to be made available include new methods of high vacuum drying, degassing, and impregnating and filling of transformers and other electrical equipment.

A provision of the agreement is that German engineers and technicians will be sent by the German firm to assist customers of NRC Equipment Corp. when requested. Leybold patents are also being transferred for U. S. production on a royalty basis.

National Research Corp. owns 24% of the German company; the remaining 76% is owned by three German firms.

Dow's contractor plan

Approximately 50 qualified insulation contractors throughout the United States will become company-approved installers of Styrofoam, The Dow Chemical Co.'s expanded polystyrene insulation material, under a program launched by the company.

Dow will furnish each contractor with technical information and merchandising aids. The contractor will agree to install Styrofoam according to Dow recommendations and to correct any installations made contrary to recommendations which fail within a period of up to two years due to faulty workmanship.

A mark of approval emblem designed by Dow will identify all designated contractors who will display the emblem on all installations they make.

Technical service literature

Gene Liberty, 500 Kappock St., Riverdale 63, N. Y., has inaugurated a technical literature service for the plastics and plastics machinery industries. He will specialize in brochures, product descriptions, newsletters, articles, etc., using an approach directed towards both technicians and management. All projects will be undertaken on a free-lance basis.

Mr. Liberty was formerly general manager of Chester Packaging.

Management-union accord

A joint statement has been issued by Foster Grant Corp., Baton Rouge, La., and International Chemical Workers Union Local 588 to the effect that they have agreed to "hold the line on wages and working conditions because of present economic conditions."

The company and union have announced that they have extended their current contract for

The Plastiscope

another year, subject to reopening by either party on 30 days' notice.

The Baton Rouge plant produces styrene monomer and employs 53 persons.

Plant for wood-filled urea

Completion of a large-scale plant for the production of wood-filled urea at Edgewater, N. J., has been announced by Barrett Div., Allied Chemical Corp. Although Barrett does not divulge the new plant's exact capacity, its output is aimed at the 50 million-lb. market for plastics wiring device and closure applications.

The new product, which will be marketed under the Plaskon tradename, will be roughly equivalent to phenolic in price and differ from the more expensive alpha-cellulose urea molding compound in that its filler is finely ground wood flour rather than bleached wood pulp.

The possible markets for this material were described in an article entitled "Why not wood-flour-filled urea?" (MODERN PLASTICS 35, 115, May 1958).

Speakers on plastics

The New York Section of Society of Plastics Engineers, Inc. has set up a speakers committee to address engineering students on opportunities in plastics. This is part of a campaign to encourage plastics study among such students.

Electrical element base stock

A paper-base phenolic material, claimed to have exceptionally low moisture absorption and shrinkage, has been introduced as electrical element base stock by Continental-Diamond Fibre Corp., a subsidiary of Budd Co., Newark, Del. Tradenamed Dilecto XXXP-30, the new material was developed specially for use in resistive ink type volume controls, small resistors, and other similar components. According to the firm, the material can be worked and stamped as easily as other element base stocks, and possesses excellent affinity for the resistive ink coating.

The manufacturer states that typical evaluation tests on thicknesses of 0.026 and 0.031 in. showed water absorption to be 1.0% after 24 hr. immersion. Linear shrinkage of a 36-in. strip was within 0.015 in. when pressed under 1000 p.s.i. at 350° F. for three minutes. It is also reported that no blistering occurred when the material was held at 392° F. for 15 minutes.

Scholarships available

Lowell Technological Institute, Lowell, Mass., has 115 scholarships valued at $27,000 available next fall, 25 of which are open to freshmen. There are also four fellowships with a total value of $5100 for which applications are being accepted at the present time.

Scholarships are open in plastics, chemistry, textiles, leather, paper, electronics, physics, and allied fields. Applications may be made and further information may be obtained from the Director of Admissions.

Recent awards to students include: Interchemical Foundation scholarship of $250 to Harry Thomas, N. Andover, Mass., junior in plastics engineering; Alumni scholarship of $150 to George Brouillette, Lowell, junior in plastics engineering; and Commonwealth of Massachusetts scholarship of $125 to Victor Proulx, Lowell, senior in plastics engineering.

Molded transformers by G-E

In connection with "Transformer transformed by premix" (MODERN PLASTICS 35, 97, April 1958), the following information on the work of General Electric Co. in that field has been received from J. E. Tevnan of G-E's Instrument Dept.:

"The General Electric Instrument Dept. at West Lynn, Mass., developed the first molded instrument transformer, specifically a 5000-v. indoor current transformer, in 1949. In September 1956, we announced the availability of a complete line of molded current transformers from the 600-v. through the 15,000-v. types, both indoor and outdoor.

"In September 1957, we announced indoor and outdoor molded potential transformers of the 5000-v. class."

Catalyst for polymerization

Triethylborane, a catalyst for the polymerization of unsaturated monomers, such as olefins, styrene, acrylonitrile, and acrylic and vinyl compounds, can now be obtained in 20-ml. sample quantities for experimental studies from Callery Chemical Co., 9600 Perry Hway., Pittsburgh, 37, Pa. The synthesis of alcohols from olefins is also possible through the triethylborane route.

The compound is a colorless liquid, miscible with most organic solvents, and may react with those containing functional groups. It is immiscible with water and does not hydrolyze. Triethylborane is a Lewis acid and forms complexes with ammonia, amines, and sodium hydride. Spontaneously flammable, its vapors ignite in oxygen at partial pressures below 1 mm. at 0° C. It melts at −92.8° and boils at 95° C.

Coating for polyolefins

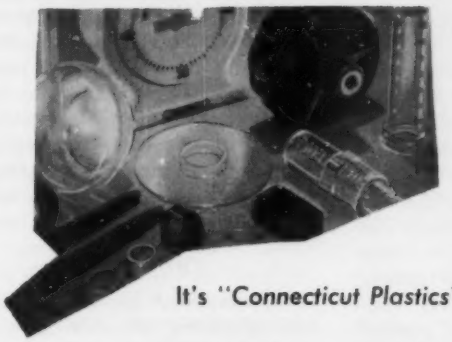
Nylene 1901, a coating for linear polyethylene and polypropylene materials, heretofore hard to coat, has been developed by C. L. Rowe Corp., 61 Van Dam St., Brooklyn 22, N. Y. It is said to be very flexible, to have good adhesion, and to resist moisture, solvents, chemicals, soaps, etc.

The product can be applied by spray, dip, and coating machine. Nylene 1901 is available in high gloss clear and pigmented opaque, pearlescent, and transparent colors.

Radiation to improve plastics

A machine that can be rented by the hour for both research and commercial radiation provides a new means of using atomic radiation to improve plastics, produce new chemicals, sterilize drugs,

In NEW ENGLAND . . .



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The Plastiscope

etc. The machine is located at the Midwest Irradiation Center, Rockford, Ill., recently opened by W. F. and John Barnes Co., Rockford, and Applied Radiation Corp., Walnut Creek, Calif.

Ionizing radiation creates free radicals and other chemical species without heat, pressure, or catalysis in both fluid and solid materials. It may provide a means of avoiding side reactions or costly catalyst separations, and new products may be developed which cannot easily be made by current techniques.

Vinyl-glass window shades

Durable window shades made of vinyl chloride reinforced with fibrous glass are being manufactured by Breneman-Hartshorn, Inc., Cincinnati, Ohio, and will be marketed under the tradename Plastiglas. These spring-roller shades are claimed to be fire resistant, washable, and to hold their shape indefinitely even with constant use.

The Lamiglas material, from which the shades are made, is resistant to mildew and other aging factors; it "reflects heat and wards off cold," according to the manufacturer, Facile Corp., 185 Sixth Ave., Paterson 4, N. J.

Plastiglas is available in white, ivory, tan, and green in widths of 36, 42, and 48 in. in standard window lengths. The window shades will be sold through department stores, national chains, and home furnishing stores at about $1.98 for the standard window size, 36 in. wide by 6 ft. long. Other sizes are priced proportionately.

Vulcanized fibre for decorative laminates

A special grade of vulcanized fibre as a backing for decorative laminates is being supplied by Continental-Diamond Fibre Corp., a subsidiary of Budd Co., Newark, Del.

The 0.005-in. thick vulcanized fibre is said to provide an excellent gluing surface and to adhere readily to the decorative core stock, thus eliminating the use of separators or release sheets. It is reported that facing surfaces of the new fibre separate cleanly and unmarred after pressing, and thus require no smoothing or sanding operation. These qualities contribute to an improved product and effect cost savings to the decorative laminators.

Adhesives

Bonds vinyl to fabrics. An improved adhesive for bonding vinyl compounds to nylon or Dacron polyester fiber fabrics has been announced by Du Pont's Textile Fibers Dept. Designated NVD, it is said to be simple to prepare from commercially available ingredients; the adhesive, partially formulated, may be obtained from B. B. Chemical Co., Cambridge, Mass.

The improved adhesive is expected to increase the use of vinyl bonded to nylon or Dacron fabrics in end uses such as truck, boat, and hatch covers, and oil well drilling rig shelters, where flexing is common and tends to cause separation of the vinyl from the base fabric.

Shelf life of adhesive-coated fabric is reported to be good with no appreciable loss of bond strength after 45 days.

Structural adhesives. According to A. G. Battaglia, manager of the Structural Products Div. of National Starch Products, Inc., 750 Third Ave., New York, N. Y., "structural adhesives, tailored to meet the wide range of demands created by today's diversified styling and manufacturing processes, will find even more diverse applications in existing fields, and in other areas as yet undeveloped."

Mr. Battaglia stated that a case in point is the wide acceptance of contact cements. "These adhesives, based on oil-resistant elastomers in combination with synthetic resins, were little known and little used just three years ago. However, they now constitute a large percentage of the total adhesives used in this country. Representing a new concept in bonding techniques by producing immediate bonds without the use of elaborate clamping equipment or long pressing cycles, contact cements permit easy adhesion of otherwise difficult surfaces," Mr. Battaglia declared.

For insulation. A two-component, internal-setting adhesive for the insulation industry has been developed by Borden Chemical Co.'s Coatings and Adhesives Dept., Peabody, Mass. Designated Insulgrip, the adhesive was designed to bond rigid insulation such as expanded polystyrene and cork. It is also said to be an excellent waterproof protective coating and moisture barrier, and to possess outstanding properties for use as a caulking compound in confined spaces.

Supplied in unit form, Insulgrip consists of one 5-gal. pail (40 lb.) of a special liquid thermoplastic flux and one bag (60 lb.) of a dry blend of natural resins and specially selected mineral fibers.

Contact adhesive. A synthetic rubber-based adhesive, specifically formulated for bonding plastic laminates to porous and non-porous surfaces, has been announced by St. Clair Rubber Co., 440 E. Jefferson Ave., Detroit 26, Mich. Tradenamed Clair-Tact, the product is said to be fast drying and does not require clamps or holding devices to achieve a strong bond.

The company states that the material withstands heat above 212° F. and resists oil, grease, and water. It is recommended for edge gluing and for bonding sharply curved surfaces.

Clair-Tact may be applied by brush, spray, or roller.

Flock adhesive. A non-yellowing, white flock adhesive, called Forever White, has been developed by Lucerne Industries Corp., 61 Van Dam St., Brooklyn 22, N. Y. According to the firm, it can be used with all synthetic fibers,

plastics and metal flitters, ground cork, mica, etc. on cotton, rayon, acetate, nylon, Dacron, Orlon, and other surfaces.

The adhesive is claimed to have good adhesion while wet during washing and not to yellow on storage or after laundering. It is also stated to be very flexible and to cure at low heat in 15 min. to 1 hr. and at high heat in minutes.

For plastics laminations. An elastomeric-base adhesive claimed to provide high strength bonds between a variety of laminating materials without the need of heat or pressure is being offered by Adhesives, Coatings and Sealers Div., **Minnesota Mining & Mfg. Co.**, 423 Piquette Ave., Detroit 2, Mich.

Designated EC-1368, this light-colored adhesive can be used in industrial operations, such as bonding decorative plastic laminates to metal counter and table tops. It can also be used for non-load-bearing sandwich panel construction in which plastic, steel, or aluminum facings are bonded to paper honeycomb cores. A variety of plastic-coated fabrics can also be bonded to rigid sub-surfaces, including steel, aluminum, and wood.

Expansion

Montecatini, Milan, Italy, plans to triple the capacity of its polypropylene plant at Ferrara within the next year from the plant's present 15 million-lb. annual capacity to 45 million pounds. The Ferrara installation has been on stream since last September. The new additions are to be designed to use an improved and simpler process which was recently developed by the company.

U. S. representative for Montecatini is **Chemore Corp.**, 21 West St., New York 6, N. Y.

The Polymer Corp., Reading, Pa., has purchased the entire outstanding capital stock of **Halex Corp.**, Detroit, Mich., which will operate its present management as a division of Polymer.

Polymer produces Polypenco nylon and Teflon semi-finished shapes and other industrial plastics. Halex manufactures pressed and sintered parts made from Nylasint, specially processed nylon powders developed by Polymer, which owns patents covering the processing, pressing, and sintering of nylon powders.

The parent company states that the operations of the new division will probably be expanded to include fabrication of products recently developed in Polymer's laboratories.

Dewey & Almy Chemical Co., Div. of W. R. Grace & Co., announces plans to build a $4 million organic chemicals and battery plant at Owensboro, Ky., which will more than double the company's capacity for vinyl acetate polymers and copolymers, and styrene-butadiene copolymer latices.

The plant will also substantially increase capacity for resin-impregnated fiber insulators used as battery separators. Existing production facilities for organic chemicals at Cambridge and Acton, Mass., and for battery separators at Acton have recently been enlarged.

The new facility is expected to begin operations early in 1959.

Dayton Rubber Co. announces the opening of the new Freedlander Research and Development Laboratories at **American Latex Products Co.**, a wholly-owned subsidiary, 3341 W. El Segundo, Blvd., Hawthorne, Calif. The 25,000-sq. ft. structure, which will augment the company's research and development facilities at Dayton, Ohio, and Waynesville, N. C., will provide basic research and product development of urethanes.

Harry Gerstin, vice president of American Latex' rigid plastics division, will direct the facilities of the laboratories; **Sam Chess** is director of research.

Celanese Corp. of America has completed construction of a new manufacturing unit at its Belvidere, N. J., plant capable of producing over 20 million lb. of polyvinyl acetate emulsions annually. These emulsions were formerly produced at the company's Linden, N. J., plant, which facilities will now be employed exclusively for the manufacture of polyester resins. The Belvidere unit also turns out cellulose acetate and cellulose propionate molding powders, cellulose acetate extruded and cast film, and tri-acetate photographic film base.

Polyvinyl acetate emulsions are used principally in the manufacture of water-thinned latex paints. Celanese is now actively engaged in developing water-thinned polyvinyl acetate primers for industrial users, including automobiles. Other volume uses for the emulsions are for adhesives, non-woven fabrics, textile finishing, and paper coating.

Carlon Products Corp., an affiliate of **American Research & Development Corp.**, Cleveland, has acquired **Plastic Industrial Products Co.**, Somerville, Mass., which will operate under Carlon's Custom Extrusion Div., headed by **James Cleminshaw. John Beaumont,** former president of the Somerville firm, will remain as general manager of the plant.

In addition to making custom extrusions, flexible vinyl tubing, welting, spline, and window channeling, Plastic Industrial will produce the complete line of plastic pipe produced by Carlon. The line includes flexible polyethylene pipe, rigid Kralastic pipe, PVC pipe, and a new sewer and drain pipe.

Reed Plastics Corp., 116 Gold St., Worcester, Mass., manufacturer of thermoplastic coloring compounds, has acquired an area of 11,000 sq. ft. in the Estabrook and Ewall Industrial Development at Worcester, bringing the firm's total manufacturing space to 50,000 sq. feet.

The new area will be used to expand the company's facilities for processing modified polystyrenes, linear polyethylene, polypropylene, and blends of linear polyethylene and high-pressure polyethylene.

Comar Plastics, Inc., Butler, N. J., has merged with **Cascade Pools,** Trenton, N. J., to form one of the larger companies in the swimming pool and vinyl liner busi-

The Plastiscope

ness. The pool company will operate as a division of Comar, with **Buster Crabbe** as executive director and **Edward M. Gorman** as president of the parent company, posts formerly held at Cascade. **Charles R. Adam** will be vice president—sales and **Robert E. West** vice president—engineering.

Comar is a manufacturer of vinyl liners for the swimming pool trade and for private brand accounts, and also produces plastic and rubber components for industry. Cascade had been marketing vinyl liner pools of all types, particularly the low-cost "Buster Crabbe" prefab pool for the do-it-yourself market.

F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa., has established a plastics laboratory to expand its research and development in plastics molding technology, aimed at broadening and intensifying research activities relating to new designs or adaptations of the company's automatic compression and injection molding equipment; evaluating new plastics materials in terms of their molding properties; and testing customers' individual molds on the specific models of Stokes presses in which they will be used to assure efficient automatic operation.

Stokes makes the facilities and services of the plastics laboratory available at a nominal cost to outside firms which may wish to evaluate the applicability of molding to their product or to undertake special research and development projects in this field on a contract basis.

Philip Morris, Inc. has acquired **Polymer Industries, Inc.**, Springdale, Conn. This is the second step made by Philip Morris toward diversification; the first was the purchase of Milprint, Inc., Milwaukee, Wis.

Polymer, which was organized in 1946 by **Dr. Frank C. Campins**, a chemical engineer, and three associates, is a producer of laminating adhesives and textile chemicals. Dr. Campins has served as chairman of the Packaging Institute's committees on adhesion and production.

Continental Plastics Corp. has moved to its new 7500-sq. ft. building at 108 N.E. 48th St., Oklahoma City, Okla. When top production schedule is re-established, personnel will be increased by 25% to assist with special packaging and custom molding problems.

The company manufactures a variety of plastics products, including louvers, handle coverings, pump parts, oil pipe line valve plates, and pharmaceutical vials. **Ray Stroud** is general manager and **Jack Davidson** sales manager.

Paper Package Co., 1036 N. Capitol Ave., Indianapolis, has purchased three adjoining buildings which will almost double the firm's existing plant. The addi-

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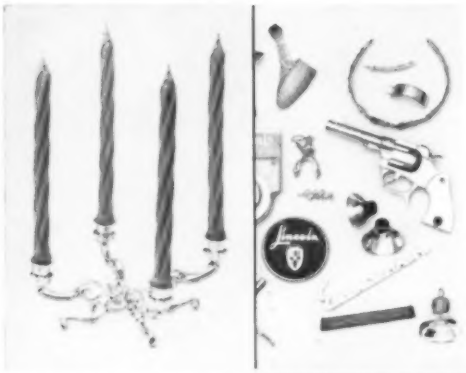

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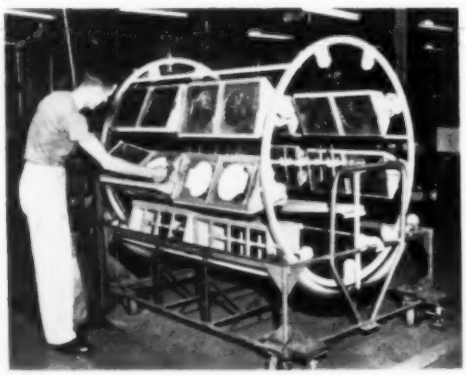

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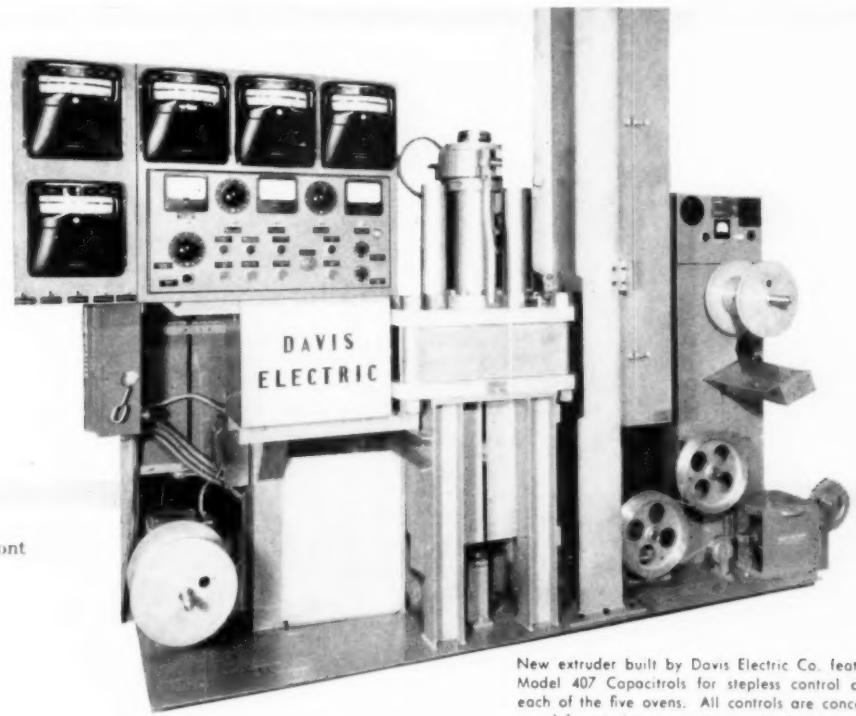
Here's a new extruder for insulating wire with Teflon* resins built by Davis Electric Co., 10 Parker Street, Wallingford, Conn., that combines high production speeds with outstanding work quality. Every machine component reflects the most advanced design ideas from the newly designed, electrically controlled tension pay-off to the five Wheelco Model 407 Capacitrols with saturable core reactors to provide smooth, stepless control for the machine's five ovens.

Accurate temperature control, always on the button without lag or overshoot, goes a long way in maintaining product quality on high-production operations like these. Wheelco 400 Series Capacitrols are available in six different control forms enabling you to choose the best one for your needs. All feature plug-in components for simplified maintenance and operating flexibility and operate on the thoroughly proved Wheelco "Electronic Control Principle." Get more data by writing today for Bulletin F-6314-3.

*Registered duPont trade name



New extruder built by Davis Electric Co. features five Wheelco Model 407 Capacitrols for stepless control of temperatures in each of the five ovens. All controls are concentrated at master panel for maximum operator convenience.

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tional floor space of approximately 180,000 sq. ft. will be used to expand production of formed and fabricated plastics packages and folding cartons. Warehouse facilities will also be consolidated.

The newly acquired property will be occupied by the spring of 1959.

The Woodman Co., Inc., 647 E. College Ave., Decatur, Ga., is expanding the activities of its Plastics Div. which was originally formed to fabricate parts for the firm's packaging machinery. Several proprietary industrial items are now being produced and the division plans to do custom fabricating of acrylic, acetate, polystyrene, polyethylene, etc. The company also has equipment for engraving on different materials, as well as for vacuum forming and fabricating laminated phenolics, etc.

Frank Pensado is head of the Plastics Div.

Resistoflex Corp. will add a 30,000-sq. ft. extension to its main plant at Roseland, N. J. The new facilities and equipment will be used for fabricating Fluoroflex-T (Teflon) pipe, pipe fittings, expansion joints, and related items.

Blane Corp., Canton, Mass., manufacturer of vinyl insulation compounds and vinyl color concentrates, has increased its production facilities by about 30% with the installation of additional machinery.

Kolker Chemical Corp., 600 Doremus Ave., Newark 5, N. J., announces plans for the construction of a phthalic anhydride unit at its Newark plant, with a designed capacity of 15 million lb. annually. Completion of the unit is expected by the end of 1958.

Container Corp. of America, 38 S. Dearborn St., Chicago 3, Ill., has acquired **Garmold, Inc.,** Totowa, N. J., maker of molded plastics, through an exchange of stock. Terms were not disclosed.

Sommers Plastic Products Co., 7 W. 18th St., New York 11, N. Y., distributor of supported and unsupported vinyl sheeting for **The General Tire & Rubber Co.,** has broken ground for a new warehouse and office building on William St., in the E. Rutherford (N. J.) Industrial Park.

The building will serve as headquarters for the company, which now has warehousing and sales operations in seven locations in New York City. Subsidiaries involved in the move are **Sommers Fabrics Corp.,** distributor for **Alkor G.m.b.H.,** Munich, Germany, and the sales and warehousing operations of **Milan Art Plastics, Inc.,** processor of embossed reptile effects.

The company also plans to ultimately transfer the operations of its manufacturing subsidiary, **Laminations, Inc.,** a press polishing and laminating plant, to the new building.

Hooker Electrochemical Co., Niagara Falls, N. Y., and **Shea Chemical Corp.,** 114 E. 40th St., New York, N. Y., have agreed to consolidate the two companies, subject to the approval of the stockholders of each company. Under the terms of the proposed consolidation, Hooker will be the continuing company and its name will be changed to **Hooker Chemical Corp.**

Shea produces phosphorus compounds.

Deceased

G. V. Sammet

G. Victor Sammet, Sr., 77, co-founder in 1907 of **Northern Industrial Chemical Co.,** Boston, Mass., died on April 13. He retired in 1956 after 49 years as president of the firm. Mr. Sammet was also a founder of the Plastic Manufacturing Group which later became The Society of the Plastics Industry, Inc.

Mitchell J. Levin, for more than 30 years an officer and director of **Breskin Publications,** died on April 21 in New York. He had been associated with the company since its inception.

A practicing lawyer and accountant, Mr. Levin received his bachelor's and master's degrees from New York University, the latter in public administration. He earned two law degrees from Brooklyn Law School—Doctor of Laws and Doctor of Juridical Science. He took his accounting courses at NYU's School of Commerce, was a Certified Public Accountant, and a charter member of the Institute on Federal Taxation.

Mr. Levin was a quiet, retiring man, liked and respected by his associates and close to his family, which consisted of his mother, wife, brother, and five sisters.

John E. Stokes, 51, central zone manager—laminating materials at the Cleveland office of **Bakelite Co., Div. of Union Carbide Corp.,** died on April 17 of a heart attack. He was a past chairman of the Reinforced Plastics Div. of The Society of the Plastics Industry, Inc. and a member of its executive board.

Meetings

Plastics groups

September 12: Society of Plastics Engineers, Inc., Regional Technical Conference, St. Clair Inn, St. Clair, Mich. Subject: "Plastics in Automotive Application."

October 1: Society of Plastics Engineers, Inc., Regional Technical Conference, Hotel Statler, Hartford, Conn. Subject: "Plastics in Packaging."

October 9-10: The Society of the Plastics Industry, Inc., 14th New England Section Conference, Wentworth-by-the-Sea, Portsmouth, N. H.

October 21: Society of Plastics Engineers, Inc., Regional Technical Conference, Curtis Hotel, Minneapolis, Minn. Subject: "Epoxies."

Other meetings

July 7-11: National Housewares Manufacturers Association, 29th National Housewares Exhibit, Atlantic City Auditorium, Atlantic City, N. J.

September 9-12: National Chemical Exposition, in conjunction with the 134th National Meeting of the American Chemical Society, International Amphitheater, Chicago, Ill.

Companies . . . People

Du Pont: Walter J. Beadle, with the company 30 years, has retired as a VP and member of the Executive Committee; he will remain as a dir. of the firm. **George E. Holbrook,** formerly gen. mgr. of the Elastomer Chemicals Dept., named a VP, dir., and member of the Executive Committee. **Charles B. McCoy** succeeds Mr. Holbrook as gen. mgr. of the department.

Polychemicals Dept.: Five research scientists promoted at the Experimental Station: **Dr. Lowell R. Perkins** to sr. supv.; **Drs. Aaron J. Martin** and **Herbert S. Eleuterio** to supvs.; **Dr. Robert H. H. Pierce, Jr.** to research sr. chemist; and **Eugene H. Zytkus** to sr. research engineer. **John M. Mack** has retired as a plastics salesman after 43 years' service, spanning the entire history of the company's plastics operations.

Borden Chemical Co.: John J. O'Connor, formerly dir.-supt. of **Alba/SA,** Borden's chemical organization in Brazil, appointed VP—international operations, with headquarters in New York City.

In Brazil, new formaldehyde and resin plants are expected to be brought on stream shortly; and a new methanol plant, the country's first, is scheduled for completion in January 1959. In Mexico, new formaldehyde facilities are also under construction.

Coatings and Adhesives Dept.: John Dersch, previously plant supt. of the Middlesex, N. J., chemical plant, now gen. prod. mgr. of the department, with headquarters at Peabody, Mass.

B. F. Goodrich Chemical Co.: Robert P. Kenney appointed dir. of international activities, responsible for coordinating company functions dealing with foreign associate companies, international sales, and foreign licensing. **Arthur M. Pounds** named supv. of new product development at the company's development center at Avon Lake, Ohio.

Union Carbide Corp.—Union Carbide Chemicals Co.: F. J. Seider promoted to mgr.—General Services; he will act as the clearing house for agent and reseller affairs at the New York office, as well as retaining over-all supervision of the General Sales Office. **J. N. Falkinburg** succeeds Mr. Seider as mgr. of the General Sales Office; he will also supervise the Contract Dept. **J. M. Sartorius** and **J. P. Galaba** appointed asst. mgrs. of the General Sales Office. **Richard W. Eddy** now mgr. of New Chemicals Div.

Bakelite Co.: Gerritt V. Lydecker named Michigan tech. sales rep. for molding materials.

Food Machinery & Chemical Corp. has created two new operating chemical departments—Organic and Inorganic.

The **FMC Organic Chemicals Dept.** includes **Niagara Chemical Div.** and the **Chemicals and Plastics Div.,** formerly the Organic Chemicals Div. **Alfred T. Loeffler,** FMC VP, named gen. mgr. of the new department. **Henry S. Winnicki** continues as mgr. of the Chemicals and Plastics Div.

The **FMC Inorganic Chemicals Dept.** comprises the **Becco Chemical Div., Westvaco Chlor-Alkali Div.,** and **Westvaco Mineral Products Div. Frederick A. Gilbert,** formerly mgr. of Becco Chemical and Westvaco Chlor-Alkali, named gen. mgr. of the new department.

National Vulcanized Fibre Co.: James R. Kallaher, with the company 22 years and formerly Chicago dist. sales mgr., appointed to the new post of gen. sales mgr. **Donald W.**

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Companies ... People

Stewart, with the firm 33 years and previously Boston dist. sales mgr., succeeds Mr. Kallaher as Chicago mgr. **George K. LeVan**, with the company 18 years and formerly special products mgr. in National's Sales Dept. in Wilmington, assigned to the New England area.

Koppers Co., Inc.: W. F. Munnikhuysen, with the company 42 years and chrmn. of the board since 1955, has retired from that post but will remain as a dir. and consultant. **Fred C. Foy**, pres. since 1955, elected to the dual position of pres. and chrmn.

United States Rubber Co.: Dr. Leland M. White, with the company 18 years and formerly asst. dir. of the Research and Development Dept., appointed dir. of research and development of the company to succeed **Dr. Sidney M. Cadwell**, who has retired after 39 years' service. **Harold B. Wright** named to the new post of Royalite commercial products sales mgr. at the Chicago plant.

The General Tire & Rubber Co.—Respro Div.: John A. Matousek, formerly VP and gen mgr. of Baker-Raulong Co., appointed gen. mgr. of the division, replacing **L. D. Bragg, Jr.**, resigned. **Arch Gartner** named sales mgr. and **Fred Newman** merchandise mgr. of shoe materials. **Alex Mann**, appointed sales mgr. in charge of vinyl bookbinding materials, will also retain his duties as product mgr. of Respro materials used in the handbag and novelty fields.

William L. Sheehan named to direct sales of Boltaflex 500, the firm's new semi-rigid vinyl sheeting for vinyl-to-metal applications. He will headquarter at Jeannette, Pa., where the material has recently gone into production.

Monsanto Chemical Co.—Plastics Div.: Edmond S. Bauer, formerly asst. dir. of sales for resin products, named associate in the Development Dept. at Springfield, Mass. **Lloyd H. Todd** now mgr. of the Engineering Dept. of the division's Texas City, Texas, plant.

Overseas Div.: Samuel C. Finnell, Jr., previously dir. of sales for plastics at Springfield, promoted to dir. of marketing for Overseas Div. at St. Louis, Mo. **Richard D. Sullivan** succeeds Mr. Finnell as dir. of sales for plastics for Overseas Div. at Springfield. **Salvadore P. Lio** appointed asst. to the gen. mgr. of Overseas Div. at St. Louis.

The Dayton Rubber Co.—Foam Div.: Lewis C. Pape, formerly gen. sales mgr. of American Latex Products Corp. (wholly-owned subsidiary), now gen. sales mgr. of the division. He will direct sales for the firm's entire line of foam products, both latex and flexible plastic, from headquarters in Asheville, N. C.

Plastics Div.: James E. Skrna and **John G. Senese** named sales engineers, with headquarters in Chicago and New York, respectively. Major products of the division include urethanes.

American Latex Products Corp., Hawthorne, Calif.: **William N. Cargile** promoted from San Francisco branch mgr. to gen. sales mgr., succeeding Mr. Pape.

Heyden Newport Chemical Corp.—Nuodex Products Co. Div.: Harvey Lieberman, appointed mgr.—Technical Service of the recently formed **Organic Peroxide Catalyst Div.**, will supervise the Peroxide Application Laboratory, conducting new product development and application studies and servicing customer technical problems. **Raymond J. Schraff** named mgr. of the new division's branch office at 815 Superior Ave., Cleveland 14, Ohio.

American Plastics Corp. (a subsidiary): **W. L. Vega** appointed VP—sales and advertising. He was formerly gen. sales mgr. of the subsidiary, developing new uses for the company's multi-color molding processes and promoting greater use of the firm's fabricating services.

Carmer Industries, Inc., Kenilworth, N. J.: **Kenneth T. Carolan** elected VP; he will also continue as gen. mgr., supervising the production of Kel-F, Teflon, and nylon rods, tubes, and sheets. **Gordon Britt** appointed sales mgr.

Zenith Plastics of Michigan, Inc., Ypsilanti, Mich., is the new name of the firm formerly known as Zenith Plastics Co. The company will expand its line of forming plastic sheet, and injection molding of nylon parts is planned.

General Electric Co.—Chemical & Metallurgical Div., Pittsfield, Mass.: **Robert L. Hatch** and **Robert G. Worman** appointed to supervisory positions, and **Dr. Sterling F. Strause** named quality control specialist. All three will devote their efforts to Lexan polycarbonate resin.

Armour & Co., Coated Abrasives Div.: Royden C. Rinker, formerly dir. of research and development, appointed to the newly created post of mfg. mgr. of the division. **Herbert W. Schnabel** named mgr. of product research and development of the division.

The Society of the Plastics Industry, Inc., Western Section, Tooling Div., presented an honor scroll to its 1957 Founding Chrmn., **Tony Guerreiro, Short-Run Plastics**, in recognition of his efforts in the creation and

leadership of this group. Through his efforts and those of **Dick Morozowicz, Douglas Aircraft Co.**, Santa Monica, Calif., vice chrmn., committees of the S.P.I. group have during the past year made notable progress toward the creation of standard techniques in the fabrication of plastics tooling for aircraft and also in the establishment of standard test methods for plastics tooling materials.

Alan M. Fullarton, Convair Astronautics, elected 1958 chrmn.

F. J. Stokes Corp.—Vacuum Equipment Div.: Charles M. Hammer named product specialist on vacuum processing equipment.

Press Div.: A. L. Maiocco, placed in charge of thermosetting plastics and molding equipment, will be responsible for customer application service, as well as product development work on the company's line of compression and transfer molding presses. **J. Thomas Kindelin** and **Charles Smith** assigned to the Chicago, Ill., district office at 3058 W. Peterson Ave. as sales engineer and service engineer, respectively.

Doven Machine & Engineering, Inc., 2706 W. Van Buren St., Chicago 12, Ill., manufacturer of slitters and cutters for all kinds of film and plastic vacuum forming machines, has become a division of **Appleton Machine Co.,** Appleton, Wis. **Eugene Doven** will continue as VP in charge of the **Doven Div.**

H. Kohnstamm & Co., Inc.: Dr. Samuel Zuckerman, plant supt. in Brooklyn, N. Y., named a VP; **Dr. Robert Cooney,** a research supv., appointed asst. VP. The company produces pigments.

Plax Corp.: Richard S. Griffith, previously an engineer in the Technical Service Dept., named to newly-created sales post of asst. prod. mgr., industrial containers. **John W. French** appointed mgr. of product development for the **Film and Sheet Div.**

Nopco Chemical Co., N. Arlington, N. J.: **Drs. S. Antoine Khawam** and **Guy Knafo** now with the research and development laboratories of the **Plastics Div.** Dr. Khawam was previously with National Aniline Div., Allied Chemical Corp.

Stauffer Chemical Co.: Charles Lindsay named VP and gen. mgr. of the **Molded Products Div.,** San Francisco, Calif.

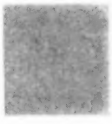
Lunn Laminates, Inc., Huntington Station, N. Y., reinforced plastics molder, and **Bellingham Shipyards Co.,** Bellingham, Wash., have signed

Plandex Plastics Processing Service Is Completely Modern In Equipment and Brainpower

THE COMPLEX ASSORTMENT *of processing assignments which come to PLANDEX make it mandatory that we keep our various divisions up-to-the-minute in technological ability and in specialized machinery. Some of the problems successfully solved in recent service to PLANDEX customers are:*

UNIFORM COLORING OF HARD-TO-HANDLE THERMOPLASTICS INCLUDING POLYSTYRENE, POLYETHYLENE, VINYL, NYLON AND BUTYRATE: Because of the unique abilities of our dual worm equipment, pigments and dyes are mixed thoroughly with granules or beads. Our processing consistently meets the highest color standards. We process virgin material and reprocess plastics scrap.

COMPOUNDING SPECIAL BLENDS TO CUSTOMERS' SPECIFIC RECIPES IS COMMON PRACTICE AT PLANDEX: Special additives are required when processing many types of resins and are compounded by PLANDEX technicians while colors, lubricants and other materials are mixed into the basic thermoplastics. PLANDEX is particularly adept at interpreting the assortment and arrangement of dual worm flights necessary to attain certain temperature levels found best to develop maximum physical properties. Among the hundreds of special blends assigned to PLANDEX for processing are densification of fluffy resins, treatment of new compounds and the coloring of low, high and medium density polyethylene.



We choose from hundreds of flight combinations on the Welding Engineers' dual worm compounder-extractor-extruders for the ultimate in quality production when rigorous milling and shearing action is required.

SCRAP RECOVERY: This is an ever-expanding field with PLANDEX for in the majority of cases *we are able to IMPROVE the quality of the material* thereby making important profit contributions to our customers. In addition, our methods reduce the weight loss. Even the most difficult-to-feed scrap, regardless of condition, is benefited by the PLANDEX quality control processing system.

VOLATILE EXTRACTION FROM THERMOPLASTICS: Performed with regularity by PLANDEX specialists. Special design machines make full use of the capabilities of the finest dual worm design, perform numerous extraction operations for the removal of moisture, catalyst, monomer, etc., from acrylic, polystyrene, copolymers, etc.

TEST RUNS: PILOT PLANT OPERATIONS: Many of our customers make use of the specialized and personalized service provided by PLANDEX to bypass expensive, time-consuming experimentation in their own plants. They use PLANDEX on virgin materials . . . on pioneering work . . . on experimental operations. By strict coordination of our workmanship and technical skills with our customers' product and process development experts, we are able to provide invaluable service in surprisingly short times . . . and at substantial savings.

For Information or Field Representative Service, Phone ANdrews 9-2130 Service, Phone ANdrews 9-2130 or write

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From the Dow family of plastics...look to

Styron 440M

for easy flow, high heat and impact resistance

Beauty . . . strength . . . durability. Styron* imparts plenty of each to this smartly designed slide projector.

For the top cover, Styron 440M was selected for its high impact strength, high gloss finish and resistance to heat from the projector's 500-watt bulb. Styron 440M was also used for the slide holder which must stand up under the impact and friction imposed by repeated handling and mechanical action. The excellent moldability of this versatile Dow thermoplastic makes possible thick side walls and extremely thin separator sections for the slide holder.

The crystal clarity of Styron 666 was put to good use in a transparent cover for the escutcheon. Its excellent flow characteristics reduce the weld lines that appear around apertures in the panel and facilitate second-surface finishing.

Twelve different formulations of Styron in an almost unlimited choice of colors contribute to good design and keep production problems scarce in many applications. For more information, contact your Dow man now. THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 1535A. *Trademark of The Dow Chemical Company

From projectors to pipe lining—
Dow plastics lead the way

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Your local Dow representative or the Dow branch office in your area will be glad to give you complete information on any of the Dow plastics.

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DOW

Companies . . . People

an agreement licensing Lunn as eastern manufacturer and distributor of the Bell Boy line.

Riegel Paper Corp.: J. B. Nunez, formerly product engineer, promoted to product supv. of converted merchant and industrial papers. **Gerard R. Hastaba** transferred from West Coast sales to salesman in Packaging Material Sales in the New York sales office.

Ciba Co., Inc., Plastics Div., Kimberton, Pa.: **Neil Casey** named supv. of advertising and related sales promotion. **William R. Dodds** appointed techn. sales rep. for the Coating Resins Dept., with headquarters at 116 E. 16th St., New York, N. Y.

Sindar Corp. has moved its executive and sales offices and service laboratories from 330 W. 42nd St. to 321 W. 44th St., New York 36, N. Y.

Plastic Molders Supply Co., Inc., Fanwood, N. J.: **Victor Merrill, Arthur Keown,** and **William Belton** named dist. mgrs.

Plastic Materials Sales Co., Inc.: H. S. Riggs appointed VP and dist. mgr.

The parent company produces colorants for thermoplastics.

Continental-Diamond Fibre Corp., a subsidiary of **Budd Co.,** has relocated its St. Louis, Mo., sales office from 2683 Big Bend Blvd. to 1246 Hampton Ave.

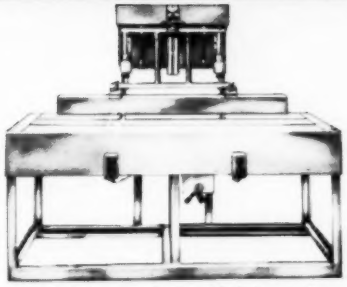
Arthur S. Reid & Associates, Weston, Mass., named exclusive sales agent to resale outlets in the New England states for **Gries Reproducer Corp.,** New Rochelle, N. Y., manufacturer of molded nylon consumer hardware products, industrial fasteners, etc.

Emery Industries, Inc. has moved its Philadelphia, Pa., office from 401 N. Broad St. to 4343 East River Dr. **J. P. Clancy** is eastern dist. sales mgr. of the Organic Chemical Sales Dept. and **J. P. Kramer** sales rep. of the Fatty Acid Sales Dept.

P. L. Blanchard & Co., Newton, Mass., appointed New England sales agent for hydride products in the plastics, rubber, and paint industries by **Metal Hydrides, Inc.,** Beverly, Mass. The primary products to be handled will be borohydride compositions to produce foam or sponge products.

Mountain State Sales Co., 210 Mining Exchange Bldg., Denver, Colo., named manufacturer's rep. by **Precision Plastics Co.,** Philadelphia, Pa.,

PRESS THE BUTTONS



Illustrated: new Post-Guided Press, designed for long seals such as rainwear, air mattresses, shower curtains, play pools, etc. Perfect leveling and adjusting. Tables available up to 96" long. Generators up to 10 KW. Write for details.

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sturdier construction

more powerful components

Whatever the power rating you require, every Sealomatic Electronic Heat Sealer provides the full power you must have for perfect results every time. The fact is that every Sealomatic is built with electronic components that will last longer in the brutal grind of daily production. In addition, Sealomatic's ease of operation because of its many "extra" features, assures immediate full production even with unskilled help.

Why let "skimpy power" rob you of the quality production you require? For more facts on electronic heat sealing, write or phone today for Sealomatic's helpful brochure, and arrange to see a representative. Remember, there are standard model Sealomatics from ½KW to 30 KW, including automatic turntable units, as well as models for applique work, lamp shade work, and automatic roll feeding. Thermal units are available for blister packaging and fast drying of adhesives.

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use SINCLAIR-COLLINS VALVES

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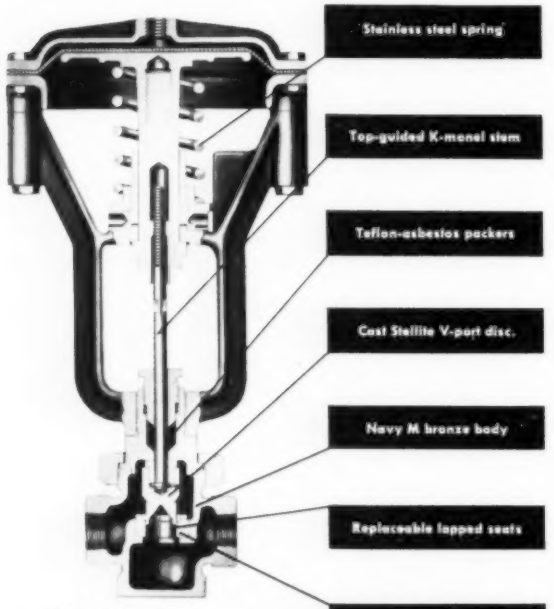
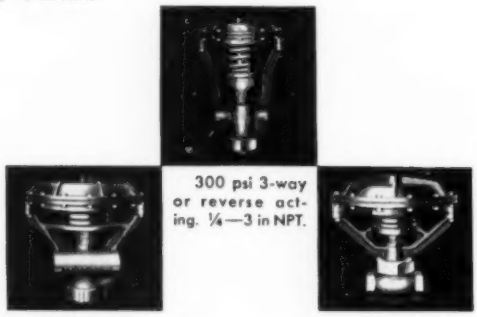


250 psi V-port pressure modulating valve. For instrument-actuated modulation of temperature, pressure or flow. Direct or reverse acting. 1/16—2 in. NPT.



300 psi 3-way or reverse acting. ¼—3 in NPT.

150 psi reverse acting or 3-way. ¼—3 in. NPT.

150 and 300 psi direct acting. ¼—3 in. NPT.

*Air and gas, too!

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injection molder and producer of Precision trophy kits—authentically-scaled models of big game animals, birds, and fish.

Fiber-Resin Corp., 125 W. Verdugo Ave., Burbank, Calif., appointed to represent **Standard Insulation Co.**, E. Rutherford, N. J., for the reinforced plastics, aircraft, and electrical industries.

Durahyde Corp., 29 E. 10th St., New York, N. Y., named exclusive distributor in the New York metropolitan area for Burmillion vinyl fabrics produced by **Goodall-Sanford, Inc.** for the furniture trade.

Missiletronics, Inc., Winston-Salem, N. C., appointed sales rep. by **New England Laminates Co., Inc.**, Stamford, Conn., manufacturer of copper-clad printed circuit laminates and specialized thermosetting plastic products.

E. L. Berman Co., 450-9th St., San Francisco, Calif., named tech. sales rep. by **Tri-Point Plastics, Inc.**, Albertson, N. Y., to handle its line of Teflon products and industrial plastic parts.

Berton Plastics, Inc., 79 Fifth Ave., New York 3, N. Y. appointed to four distributorships: **Owens-Corning Fiberglas Corp.** (fibrous glass for plastics reinforcement); **United States Gypsum Co.** (epoxy resins and gypsum products); **Pittsburgh Plate Glass Co.** (polyester resins and color paste); and **United Merchants Industrial Fabrics** (glass cloth, woven rovings, and tapes).

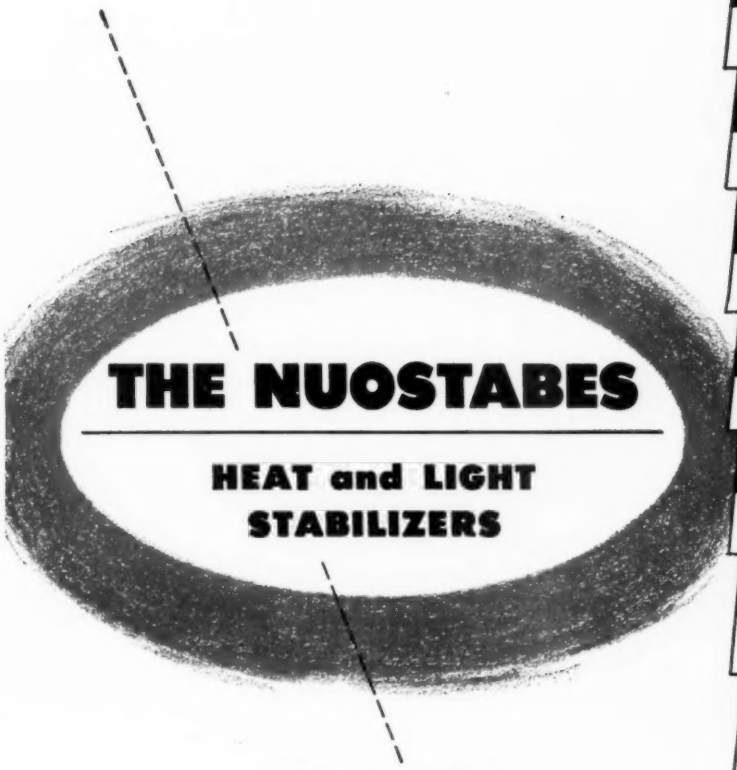
Berton's branch office is located at 1405 Locust St., Philadelphia 2, Pa.

Ivan T. Bauman Co., 817 N. 2nd St., St. Louis 2, Mo., named agent by **Godfrey L. Cabot, Inc.**, Boston, Mass., for the sale of carbon black in Missouri and southern Illinois.

Machinery & Machine Supplies Co., Inc., 305 E. 47th St., New York, N. Y., named exclusive distributor in the United States and Canada by **Alpha Co.**, Stockholm, Sweden, a member of The Ericsson Group, for its 100-ton phonograph record press and 100- and 200-ton plastics molding presses.

The presses, used extensively in Europe, are being introduced here for the first time, together with molds for the recording and plastics industries, and special hydraulic reducing valves.

Transilwrap Co. has moved from 2814 W. Fullerton Ave. to new and enlarged quarters at 4427 N. Clark St., Chicago 40, Ill. The company is



Your Certified Source of Supply

"Uniformity certified" appears on every container of Nuostabes®—your guarantee of top performance of vinyl products in processing and in use. This superior line of stabilizers contains the compounds best suited to your present requirements.

We invite you to call on our Technical Staff for assistance in specifying the Nuostabe you need. Extensive research and delivery facilities have made Nuodex a leader in the manufacture of Additives and S/P Chemicals — for more than 25 years. Write for our catalog and free samples of the products listed.

The multi-plant facilities of the Corporation are behind each Nuodex Product. Among those products of interest to you, in addition to the stabilizers here listed — are a complete line of metallic stearates and organic peroxides.

- DIBASIC LEAD STEARATE V-1
- LEAD STEARATE V-2
- BARIUM RICINOLEATE V-10
- BARIUM ZINC COMPLEX V-12
- BARIUM ZINC COMPLEX V-14
- CADMIUM LAURATE V-20
- CADMIUM V-21
- CADMIUM COMPLEX V-122
- BACAD LAURATE V-130
- BACAD (CO-PRECIPITATED) V-131
- BARIUM CADMIUM COMPLEX V-132
- BARIUM CADMIUM COMPLEX V-133
- CHELATOR V-40
- CHELATOR V-141
- CHELATOR V-142
- ZINC V-50
- ZINC COMPLEX V-152
- CALCIUM STEARATE V-60
- STRONTIUM STEARATE V-70
- STRONTIUM ZINC LAURATE V-171
- ORGANO-TIN V-82
- ORGANO-TIN V-183
- EPOXY V-205
- VINYL FUNGICIDE 100-VT

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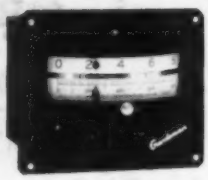
TUBELESS* TEMPERATURE-CONTROLLERS



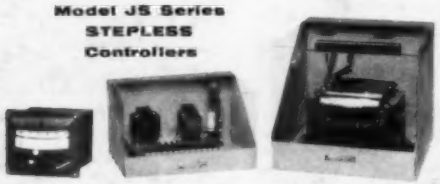
Model JP Series
PROPORTIONING Controllers

This time-proved unit is widely used for closer control than the basic On-Off system permits. JP *anticipates* temperature changes, tends to stabilize the system to desired temperature, makes new harder-to-mold materials a simple production job.

Model JPT Series
3-POSITION Proportioning Controllers

Designed especially for plastic extruding and injection molding machines, to control heating of barrel or cylinder, and cooling with either air or water. Ideal for high-friction materials like Rigid Vinyl. Provides Model JP Proportioning Control of heaters *plus* automatic control of cooling cycle *only* in case of overshoot caused by heat of friction or temporary shut down. Avoids heat-waste and decomposition of plastic materials.

Model JS Series
STEPLESS Controllers



Closest practicable control, virtually eliminates temperature variable. Constantly modulates input to demand. Prolongs heater life by reducing thermal shock. No tubes, no relays. Multi-load units, adjustable control-band width, manual reset. Simplest operation: one knob.

"Minimum maintenance. No need for "tuning" to suit tube-ageing. Reliable — Guaranteed — AND these Gardsman Controllers save on original cost! Specify model series in writing for data.

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Companies . . . People

a supplier of Plexiglas, Vinylite, cellulose acetate, butyrate, high-impact styrene, nylon, and polyethylene materials.

George W. Seagren appointed dir. of research of **Stoner-Mudge Co., Div. of American-Marietta Co.**, Pittsburgh, Pa. He formerly was head of a multiple fellowship sponsored by S-M at Mellon Institute. Mr. Seagren joined Stoner-Mudge in 1937 as a member of its research fellowship on protective coatings at Mellon Institute.

Frank W. Reinhart, chief of the Plastics Section of the **National Bureau of Standards**, Washington, D. C., was presented with an honorary degree of Doctor of Science by Juniata College, Huntingdon, Pa.

Edward J. Babis, formerly admin. asst. to the gen. mgr., named Exec. VP and gen. mgr. of **American Molding Powder & Chemical Corp.**, 703 Bedford Ave., Brooklyn 6, N. Y.

Merle W. Kremer appointed VP of the **Parts Div.** of **Sylvania Electric Products, Inc.**, Warren, Pa., manufacturing agency for Sylvania's plastics products. He will also continue as gen. mgr. of the **Parts** and **Chemical and Metallurgical Divs.**

Dr. Arthur L. Davis appointed VP of the **Electro-Technical Products Div.** of **Sun Chemical Corp.**, 750 Third Ave., New York 17, N. Y.

Arthur E. Young, mgr. of **The Dow Chemical Co.'s** new **Zefran Textile Fibers Div.**, near Lee Hall, Va., appointed to the board of directors of **The Saran Yarns Co.**, Odenton, Md. He was asst. mgr. of Dow's Plastics Dept. before he organized the Textile Fibers Dept. in 1956.

Laurel G. Parkinson appointed gen. sales mgr.—chemicals of **Amoco Chemicals Corp.**, Chicago, Ill. He will be responsible for sales of the firm's industrial organic chemicals and petroleum additives, as well as advertising, sales technical service, and sales training.

Gen. James M. Gavin, who recently retired as Army Chief of Research and Development of the United States Army, elected a VP and director of **Arthur D. Little, Inc.**, industrial research organization. Gen. Gavin will headquarter at Acorn Park, the ADL research center in W. Cambridge, Mass.

Richard Rouviere, previously market extension engineer, appointed to the newly-created post of regional sales

(*To page* 264)

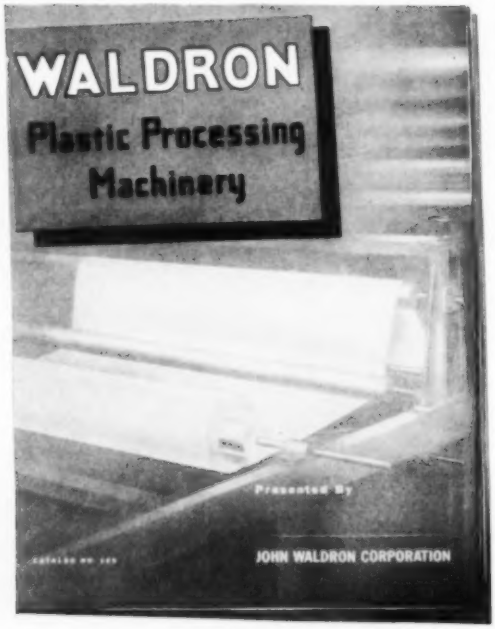
Phonograph records based on top quality VC-113 vinyl chloride resin have high flexural strength, good heat and abrasion resistance and a very low noise level even after repeated playings. You can manufacture them at lower cost, too, because with VC-113 . . .

- the unusually high bulking density and rapid fusion rate allow for more pounds of resin per Banbury or mill charge and a shorter mixing cycle. You need less storage space, too.
- balanced flow characteristics during molding result in fewer rejects from "non-fills". No dusting problem, either.
- low volatile content and excellent heat stability minimize blisters and porosity. You get lot-to-lot uniformity, shipment-to-shipment consistency.
- all pigments, extenders and stabilizers commonly used in the record industry are compatible with VC-113. You also get more processing latitude with those hard-to-press set-ups and the stereophonic disc.

These points add up to higher quality pressings at lower handling and production costs. Sound interesting? It will pay you to check with Borden immediately. Write The Borden Chemical Company, Polyvinyl Chloride Dept. MP-68, 60 Elm Hill Ave., Leominster, Mass.

IF IT'S A *Borden* *Chemical* IT'S GOT TO BE GOOD!

SOME DOs AND DON'Ts



OUR 20-PAGE BULLETIN WILL BE HELPFUL

TABLE OF CONTENTS

A — FORMATION OF PLASTIC FILMS
- a — Supported
  1. Solution Coating
  2. Dispersion Coating
  3. Hot Melt Coating
- b — Unsupported
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B — DECORATION OF PLASTIC FILMS
- a — Embossing
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- e — Striping
- f — Flocking
- g — Top Coating

C — SLITTING AND WINDING

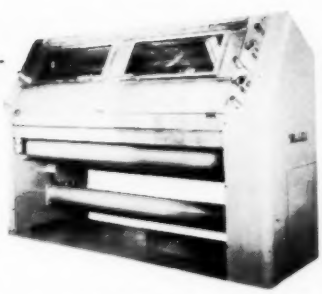
D — LAMINATING

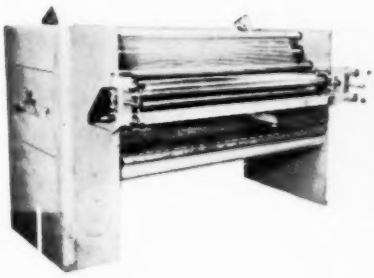
E — SPECIAL WEB PROCESSING

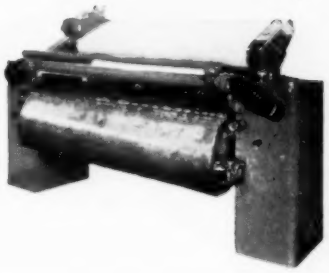
Send For Your Copy

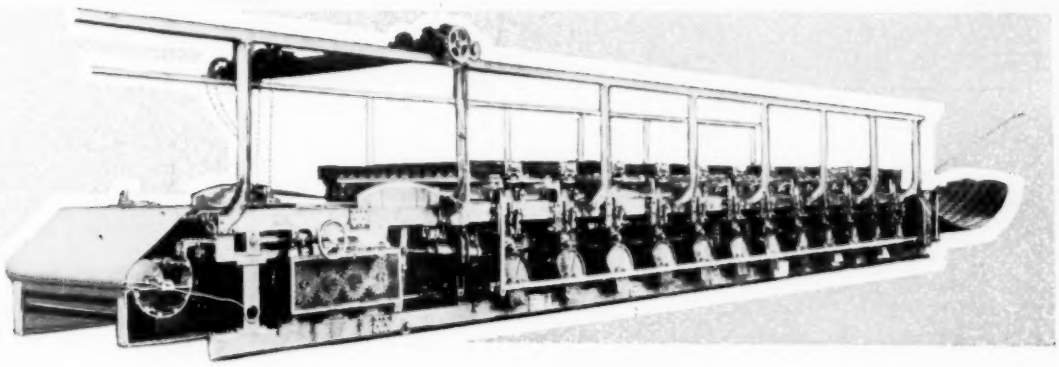
ABOUT PROCESSING PLASTIC WEBS!

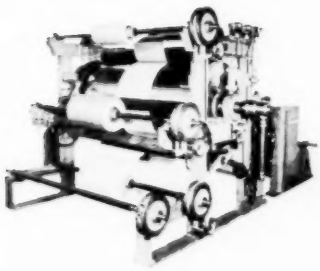
A reading of this 20-page discussion of plastic web processing will also give you a pretty good idea of the broad service Waldron Engineers can offer in connection with your requirements. Certainly they have the experience . . . since plastics first came on the market (and long before that). The company's policy of custom designing for each order individually will assure you of just the right equipment and proper coordination of all the units.

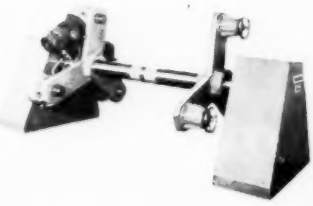












THE MIDLAND-ROSS GROUP
OF COMPLEMENTING SERVICES

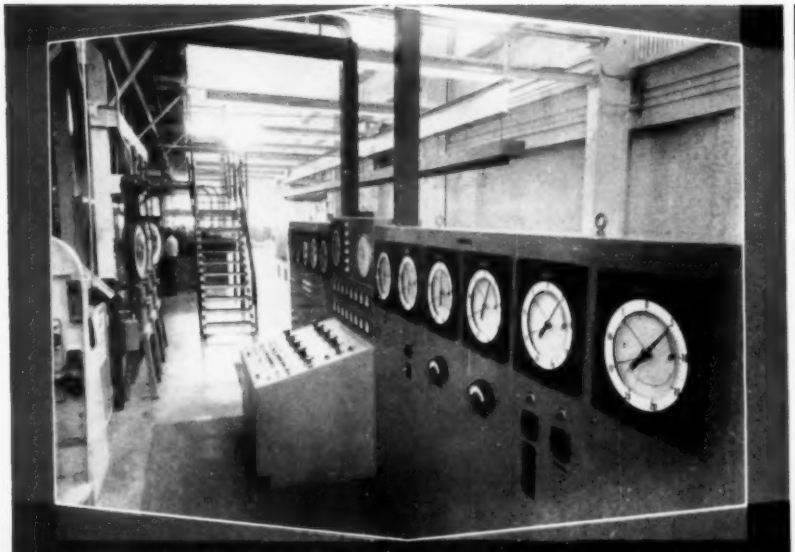
J. O. Ross Engineering, New York
John Waldron Corporation, New Brunswick, N. J.
Andrews and Goodrich, Boston
Ross Engineering of Canada Limited, Montreal
Ross Midwest Fulton, Dayton
Hartig Extruders, Mountainside, N. J.
Carrier-Ross Engineering Company, Ltd., England

JOHN WALDRON CORPORATION

A unit of J. O. Ross Engineering Division Midland-Ross Corporation

New Brunswick, New Jersey
CHICAGO • LOS ANGELES

West Coast Representative: Bojanower Machinery Service Company
5270 East Washington Boulevard • Los Angeles 22, California



CONTINUOUS IMPREGNATING & COATING SYSTEMS

WITH INSTRUMENTATION FOR THE BEST IN PROCESSING

TECHNICAL DATA: COMPLETE FIBRE ORIENTING SYSTEMS: ON REQUEST

C. A. LITZLER CO., INC.

1817 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"

EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.

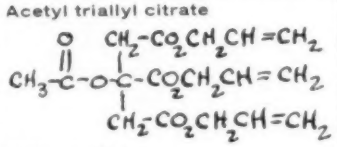
A new monomer for pilot studies

ACETYL TRIALLYL CITRATE

(with 0.01% Hydroquinone)

Acetyl Triallyl Citrate (ATAC) is now available in pilot quantities for investigational use. This new monomer will homopolymerize at 70-80° C. with 1-2% peroxide catalyst. ATAC also will copolymerize with other monomers and will cross-link with unsaturated polyester resins. ATAC is miscible in all proportions in Acetone, Benzene, Chloroform, Glacial Acetic Acid, Methanol, Ethanol, and Isopropanol.

Acetyl triallyl citrate



Mol. wt. 354.3

Tentative specifications:

Boiling Range: 142-143° C. (at 0.2 mm. Hg)

Flash Point: 171-174° C.

Specific gravity at 20° C.: 1.140 gms./ml.

Refractive Index: $n^{25°C}$ D 1.4665

Information presented above is believed to be accurate but carries no guarantee of responsibility on the part of the Sumner Chemical Company. In addition, none of this information can be taken as a recommendation to use the materials as described in violation of existing or future patents.

SUMNER CHEMICAL COMPANY

DIVISION OF MILES LABORATORIES, INC.

Zeeland, Michigan • *General Sales Offices:* 6 E. 45th St., New York 17, N.Y.

West Coast: B. L. Holmes, La Canada, Cal.

Companies . . . People

mgr. of **Devcon Corp.**, Danvers, Mass., covering the northeastern states and Canada. The company's products include mold release agents, epoxies, and adhesives.

Jack H. Dollinger, formerly acting gen. mgr., elected VP, gen. mgr., and a dir. of **Ferro Chemical Corp.**, a wholly-owned subsidiary of **Ferro Corp.**, Bedford, Ohio.

John I. Rudge elected a VP of **Carlon Products Corp.**, an affiliate of **American Research & Development Corp.**, Cleveland, Ohio. He will be responsible for the southeastern district, with offices at Asheville, N. C.

John F. Bergin, head of the Patent Dept., elected VP of **Rohm & Haas Co.**, Philadelphia, Pa.

J. E. Burrell named gen. mgr. of operations of **Columbia-Southern Chemical Corp.**, Pittsburgh, Pa., to succeed the late **Robert L. Hutchison**, VP of operations.

Jack Rebman, formerly a design specialist at Lockheed Aircraft Co., appointed to direct the newly created Research and Experimental Dept. of **Revell, Inc.**, Venice, Calif.

Wilbur B. Pings appointed gen. mgr. for the chemical lines of **Kessler Chemical Co., Inc.**, State Rd. and Cottman St., Philadelphia, Pa. The firm's products include plasticizers and surface active agents.

Arthur Schwartz named gen. mgr. of **Kleen-Stik Products of California, Div. of Kleen-Stick Products, Inc.**, 8626 S. San Pedro, Los Angeles, Calif.

Frank T. Cunniff has joined **Pittsburgh Coke & Chemical Co.**, Pittsburgh, Pa., as market research mgr. He was formerly a distribution and market analyst at Esso Standard Oil Co. and Nitrogen Div., Allied Chemical Corp.

Frank G. Sorensen, Jr. appointed plant supt. of **Elmes Engineering** and **King Machine Tool Divs., American Steel Foundries**, Cincinnati, Ohio, manufacturer of hydraulic presses and equipment.

John J. Schmitt named marketing mgr. of **Kemlite Corp.**, Joliet, Ill., manufacturer of fibrous glass-reinforced plastic building panels.

John H. Foley appointed southeastern regional rep. for **Reynolds Metals Co.'s Plastics Div.**, with headquarters in Camden, N. J. He will be concerned with sales of the firm's polyvinyl alcohol film and polyvinyl

chloride film. Mr. Foley was formerly asst. to the Plastics Div.'s sales mgr. in Gary, Ind., and Grottoes, Va., which is the site of a new Reynolds film plant.

R. G. Luskin named West Coast dist. mgr. of **Goodyear Tire & Rubber Co.'s Chemical Div.**, with headquarters in Los Angeles, Calif.

Arthur J. Warner, previously with International Telephone & Telegraph Corp., has joined **DeBell & Richardson, Inc.**, Hazardville, Conn., as an insulating and semi-conductor consultant to the electrical and electronics industries.

Donald C. Foukal named sales mgr., **Plastics Div., The Vlchek Tool Co.**, Cleveland, Ohio. He will supervise sales and marketing of the firm's plastics products, including custom molding, hose nozzles, floral containers, etc.

Herbert A. Spaulding named Detroit resident rep. for **Angier Adhesives Div., Interchemical Corp.**, with headquarters at 3100 14th St., Detroit 16, Mich.

Dr. Cataldo Cialdella has joined **Houghton Laboratories, Inc.**, Olean, N. Y., and will head a new development group within the Research Dept.

Thomas E. Powers appointed asst. to the sales mgr. of **National Polymer Products, Inc.**, a subsidiary of **The Polymer Corp.**, Reading, Pa.

Robert A. Karasek named sales mgr. of **Chris Kaye Plastics Mfg. Co.**, Madison, Ill., custom molder and extruder.

William B. Carter has joined **Columbian Carbon International, Inc.**, New York, N. Y., as staff asst. to the VP. His former affiliations include Dewey & Almy Chemical Co. and Godfrey L. Cabot, Inc.

Anthony P. Beaudry, 129 Main St., Shrewsbury, Mass., named tech. rep. for **Reed Plastics Corp.**, Worcester, Mass. The company manufactures thermoplastic coloring compounds.

Jesse Gilman, formerly pres. of Manhattan Devices, Inc., now tech. sales rep. of **Rona Laboratories, Inc.**, Bayonne, N. J. The firm produces synthetic and natural pearl essence and pearlescent pigments.

Howard Zimmer named a sales rep. for Washington and Oregon by **H. Kohnstamm & Co.**, New York, N. Y., manufacturer of colors for the plastics industry.

Joseph J. McLoughlin named market research mgr. of **Taylor Fibre Co.**, Norristown, Pa., producer of vulcanized fibre and laminated plastics.

AT YOUR SERVICE

THE RESULTS OF 30 YEARS OF RESEARCH ON ORGANIC PEROXIDES

For over three decades we have specialized in the manufacture of organic peroxides. Today our peroxides are outstanding in quality and closely controlled uniformity. During all these years we have maintained a progressive program of research and development work for the purpose of making organic peroxides and their compounds available to industry in the form best suited to each particular application. We are confident that in the groups of organic peroxides listed below you will find the key to some of your processing problems.

Diacyl Peroxides **Dibasic Acid Peroxides**
Ketone Peroxides **Aldehyde Peroxides**
Alkyl Peroxides & Hydroperoxides
Alkyl Peroxyesters

Our Research and Technical Staffs invite your consultation.

WRITE FOR A COPY OF

1. "The Evaluation of Organic Peroxides in Terms of Half-Life Data." A paper resulting from Research by LUCIDOL.

2. "The Use of Organic Peroxides in the Reinforced Plastics Industry." A paper on proper methods of storage and handling of organic peroxides.

LUCIDOL DIVISION
WALLACE & TIERNAN INCORPORATED
Dept. 4, 1740 MILITARY ROAD
BUFFALO 5, NEW YORK

Classified Advertisements

EMPLOYMENT • BUSINESS OPPORTUNITIES • USED OR RESALE EQUIPMENT

Machinery and equipment for sale

FOR IMMEDIATE SALE: 12 oz. De Mattia injection machine in good condition. 1946 model. Indiana location. Reply Box 3606, Modern Plastics.

FOR SALE: 2½ oz. Van Dorn injection machine only one year old. Also 2 oz. Van Dorn, 1948 model. Can be inspected at Ohio location. Reply Box 3607, Modern Plastics.

FOR SALE: 1—100 ton hydraulic press with pump and motor 22" x 22" platens—$1,500.00. 4—100 ton hydraulic presses 18" x 18" platens with pump and motor—$1,200.00. 1—Banbury mixer—3A. 4½" NE extruder—$2,000.00. 10 H.P. pumping units with tanks unused—$450.00, and used pumping units without tanks—$200.00. Reduction units. Ludonite Corp., 88 St. Francis Street, Newark, N. J.

FOR SALE: 12—Baker-Perkins 200 gal. Sigma-blade mixers; 6—Pfaudler 500 gal. glass-lined reactors. Farrel-Birmingham 1500 HP horiz. reducer, 5:1 ratio. Ribbon mixers 336, 100, 75 cu. ft. Stokes tablet or preform presses, rotary cutters, mills, etc. Perry Equipment Corp., 1429 N. 6th St., Phila. 22, Pa.

FOR SALE: One Alexander 3 dimensional model A1 pantograph. Complete and in perfect condition. One Alexander universal bench model cutter grinder, complete with collets, unused. Sacrifice, no reasonable offer refused. Principals only, no dealers. Phone or write for appointment. Benkay Jewelry Co., Inc., 98 Canal Street, N. Y. C. Phone: WAlker 5-1880.

FOR SALE — FLASH REMOVER: American wheelabrator serial #94155 (1954) (8)—19" tables (like new) 15 H.P—220/440 dynamic corp—Variable speed control motor new cost $13,-500.00 (best offer). Spring 7-6654—Yeager Foundry Associate's, 4601 West Roscoe Street, Chicago, Illinois.

FOR SALE: Injection presses: automatic Stokes 4 oz. & Watson 5 oz.—Jackson Church 64 oz. HPM 24 to 4 oz. Reed 24, 16, 12, 8 & 4 oz. Lester 8 oz. Waston 48 & 28 oz. DeMattia vertical 4 oz.—DeMattia 12 oz. Lewis 6 oz. Moslo 2½ oz. Van Dorn 1 oz. For extruders: 30" sheet die w. 52" pull-off. 36" Brown VacForm & plug-assist setup. Dulmage 28" metering pump.—Cumberland model 0 & 10 grinders. Mold-chiller circul.—2 HP Boilers.—Apex 2 col. container imprint mach. —compression presses various sizes. Tavannes automatic cap mold. presses. Preform presses Stokes 280 G & Defiance 45.—Baker-Perkins 200 gal. mixer. 43 cft ribbonmixer—vacforming machines 30 x 30". Dake 200 T nydraul. press.—List your surplus equipment with me. Wanted: Extruders 1½ to 6". Defiance 20 preformpress.—All midwest locations. —Justin Zenner, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: Stokes DDS2. Unused. Stokes RD3 Stokes Rdl. Stokes T-50 ton Stokes standard press. Synthetic Plastics Co., 88 St. Francis Street, Newark 5, N. J.

FOR SALE: 100 gal. jacketed stainless mixer Baker Perkins. 3 ribbon mixers. 2 BB double arm mixer. 4—50 ton Watson Stillman presses self contained. Machinecraft Corp., 800 Wilson Avenue, Newark, N. J.

FOR SALE: 1 MPM 1½" electric extruder; 1 Watson Stillman 475 ton compression molding press, 48 x 32" platen area; 1 22 x 60" plastics mill, 150 HP; 1 Porter 35 cu. ft. stainless steel blender; 3 Cumberland #0-½ granulators, 3 HP; also mixers, presses, grinders, etc. Chemical & Process Machinery Corp., 52 Ninth St., Brooklyn, N. Y.

FOR SALE: (6) 100 ton, 10" ram, 10" stroke @ $1250; (7) 200 ton, 9" stroke, 14" ram, 36x36, @ $2160; (6) 200 ton, 9" stroke, 15" ram, 30x30 @ $1850; (1) ton complete, 18x18 @ $1850; (1) 200 ton 16" ram, 30x30 @$2460; (2) 200 ton 16" ram, 42x42 @ $2850; (1) 200 ton, 15" ram, 42x42 @ $2600; (3) 250 ton (2) 12" ram, 30x60 rebuilt @ $3675. Hydraulic Sal-Press Co., Inc., 386-90 Warren Street, Bklyn, N.Y.

FOR SALE: 64 Oz. Injection Molder with Pre-Plasticizer mold size 32"x50" 750 Ton clamp. Lester 8 oz. Model 2½ L (1949). DeMattia 12 oz. (1946). DeMattia 4 oz. H.P.M. Rubber Injection molders, 21½" x28" mold space, steam heated platens. Watson-Stillman 300 Ton Semi-Automatic Compression molding Press (1947) self-contained, mold size 34"x27". Watson-Stillman 250 Ton 28"x24". Watson-Stillman 140 Ton 22"x16". Waterbury Farrel 85 Ton 20"x24". W.F. 63 Ton 15"x15". Laboratory Presses—15 Ton 10"x8" and 10 Ton 6"x6" Platens. Scrap Cutters. Valves, Accumulators, Hydraulic Presses —all sizes. Aaron Machinery Co. Inc., 45 Crosby St., New York, N.Y. Tel.: WAlker 5-8300.

FOR SALE: Stokes 300 ton and Baldwin-Southwark 200 ton semi-automatic Transfer Molding presses. 2500 ton downstroke 54"x102". 300 ton multi-opening 40"x40". French Oil 250 ton 38"x28". Elmes 200 ton 28"x26". Farrel 200 ton 20"x80". 200 ton Hobbing Press. 200 ton 16" Record Presses. D&B 140 ton 36"x36". French Oil 120 ton self-contained. W.S. 120 ton 24" x24". Also Lab. Presses to 100 tons. Hydraulic Pumps and Accumulators. Van Dorn 1 and 2 ounce Injection Machines. Other sizes to 80 oz. Baker-Perkins and Day jacketed Mixers. Plastic Cutters. Oxford 57" Slitter. Seco 6"x13" and 8"x 16" Mills and Calenders. Oil and Elect. Plastic Extruders, lab to 6". Single & Rotary preform Presses ½" to 4". Partial listing. We buy your surplus machinery. Stein Equipment Co., 107—8th Street, Brooklyn 15, New York.

GOOD EQUIPMENT: At the right price. Falcon Ribbon Blenders in Steel or Stainless; NRM 2½" Extruder, Rotary Cutters by Ball & Jewell, Sprout-Waldron, Abbe; Baker Perkins heavy duty dbl. arm Mixers, 100, 200, 300 gal; French Oil Mill Hydr. Press 450 Ton; Blaw Knox S/S Resin Kettle 7'6"x7'6", Jktd. Agtd.; Sturtevant 300 cu. ft. Batch Mixer; Stokes and Colton Rotary and Single Pre-form Presses; Send for new First Facts, containing complete illustrated inventory; First Machinery Corp., 209 Tenth St., Bklyn 15, N.Y. Fred R. Firstenberg, Pres.

LIQUIDATION SALE: Molding Plant; (2)—325 Ton French Oil Compression Presses. (1)—300 Ton Erie Compression Press. (2)—170 Ton Transfer Presses. (1)—100 Ton Compression Press. (3)—75 Ton Transfer Presses. (1)—No. 5½ T Colton Preform Machine. (1)—3 DT Colton Tablet Machine. Reply Box 3602, Modern Plastics.

FOR SALE: 1 Baker Perkins 15USE, 100 gal. all stainless double arm Vacuum mixer; 1—Baker Perkins size 15VUUM, 100 gal. double arm mixer, 100 HP motor; 1—Baker Perkins size JNM 100 gal. double arm mixer; 6—Day 250 and 100 gal. double arm mixers; 1—Ball & Jewell #1 Rotary Cutter; 2—Two Roll Mills 6" x 12"; 6—Stokes model DD2, DS3, D3 and B2 Rotary Preform presses; 4—Stokes model "R" single punch Preform presses; Also: Sifters, Banbury mixers, Powder mixers, etc., partial listing; write for details; we purchase your surplus equipment; Brill Equipment Co., 2407 Third Ave., New York 51, N. Y.

JUST SECURED: Most Modern Packaging and processing machinery. Equipment installed within last 2 years. Available at great savings. 4—Hayssen model F compaks with net weight scales, bulk and dribble feeds, electric eyes. 4—Ceco model 40-9½-GG automatic adjustable cartoning units. Also model TT. 1—Pneumatic Scale automatic carton feeder, bottom sealer and top sealer with interconnecting conveyors. 6—Fitzpatrick model D-6 Stainless steel comminuters. 4—Day size G. 1500 lb. Ribbon type powder mixers. 2—Rietz disintegrators model RD18 complete with 50 HP motors. 1—Enterprise Foundry Disintegrators model EVM3 complete with 50 HP motors. Complete details and quotations promptly submitted. Union Standard Equipment Company, 318-322 Lafayette St., New York 12, N. Y., Phone: Canal 6-5334.

Machinery wanted

WANTED TO BUY: Used injection molding machines, ovens, granulators. One machine or complete plant. Acme Machinery & Mfg. Co. Inc., 20 South Broadway, Yonkers, N. Y. YO 5-0900, 102 Grove Street, Worcester, Mass., Pl 7-7747.

Materials for sale

FOR SALE: 3700 lbs. granular ethyl methacrylate (DuPont), 3000 lbs. Dioctyl sebacate (Rohm and Haas). Wm. E. Hooper & Sons Company, 3500 Parkdale Avenue, Baltimore 11, Maryland.

FOR SALE: Styrene, hi-impact, large quantities reground available, white, light green, light blue, pink, etc. Low prices, write, wire or phone. Success Plastics Corporation, P. O. Box 506, Indianapolis, Ind. Liberty 6-2919.

Materials wanted

WANTED: Large quantities mixed colors reground Hi-Impact polystyrene. Must be genuine Hi-Impact. Mr. Thomas, 5252 South Kolmar Avenue, Chicago 32, Illinois.

WILL PURCHASE: For cash, prime or off grade Styrene, Polyester Resin (any type), Cellophane or Acetate Film (min. 36" wide), glass cloth, Mat or Rovings, Pigments and catalysts. Reply Box 3600, Modern Plastics.

WANTED: Plastic scrap. Polyethylene, Polystyrene, Acetate, Acrylic, Butyrate, Nylon, Vinyl. George Woloch, Inc., 514 West 24th Street, New York 11, N. Y.

(*Continued on page* 268)

EACH NB & C. INJECTION PRESS ENJOYS TWO YEARS GUARANTEE

NB&C

INJECTION PRESSES
ENSURE FIRST-CLASS
GREAT PRODUCTIVITY
CUTTING DOWN COSTS

powerful newly-conceived, built-in oildynamic circuits

increased plasticizing capacity

higher injection rapidity

SPECIFICATIONS

model	NB 28	NB 30 Record	NB 40	NB 60 E	NB 100	NB 120 E	NB 160
injection capacity oz.	1	1 ÷	1.4	2.1	3.5	4.2	5.6
hourly plasticizing capacity lbs.	6.6	12	15.4	28.6	26.4	53	39.6

			FULLY AUTOMATIC				
model	NB 220 E	NB 360/520 E	R 01	R 02	R 6 FA	R 12 FA	R 20 FA
injection capacity oz.	75	13-19	0.53	0.85	2-3	4-6	8-12
hourly plasticizing capacity lbs.	8	97	7.7	7 7	29	53	75

ASK FOR LITERATURE !

NB&C

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CABLES NEGRIBOS MILANO

ARE YOU HANDY

with thermoplastics?
Do you know equipment, techniques, applications in the fields of
extrusion, molding and vacuum forming?

Engineers
and
Chemists

at all degree levels
with two to ten years
commercial or laboratory experience
can put their fingers into
a challenging job with
a research-minded company
in the Chicago suburban area.

Write:

STANDARD OIL COMPANY (INDIANA)

T. G. Stack
P. O. Box 431-H
Whiting, Indiana

(*Continued from page 266*)

WANTED: Cellulose acetate butyrate scrap, clear, wanted, any quantity by end user. Must be clean and free from contamination of other types of plastics, and foreign matter. Send sample, and quantity available. Steady buyers. Reply Box 3611, Modern Plastics.

WANTED: Nylon molding or extrusion scrap. Write or call collect. Kopplin Molding Corp., D. M. Schneider or Karl Kopplin, St. Louis, Missouri.

WANTED: Acrylic and Styrene purgings. Also: reground and surplus material—any color. Claude P. Bamberger, Inc., One Mount Vernon Street, Ridgefield Park, N.J. Telephone: HUbbard 9-5330.

Molds for sale

FOR SALE: Houseware molds, comb molds, also some novelty and specialty items. All in excellent condition. No reasonable offer refused. Send for list. Reply Box 3615, Modern Plastics.

Help wanted

COATING PLANT MANAGER: General manager for plant in Eastern Massachusetts for vinyl coating, calendering and machine operations. Unusual opportunity for man with good technical background and administrative ability. Applicant should submit detailed resume and most convenient time for personal interview. All replies will be held in strict confidence. Reply Box 3619, Modern Plastics.

WANTED: Salesmen for newly formed Pigment division of reputable dyestuff manufacturer. Openings available in various territories. Experience in pigment sales to ink, paint and plastic trades desired. Please send complete resume to Sandoz, Inc., Pigment Division, 61 Van Dam Street, New York 13, N.Y.

MANUFACTURER'S REPRESENTATIVE WANTED: Injection molder desires representation in New England area and Metropolitan New York. This is a long established company located in Massachusetts and now entering custom molding field. Strong engineering department. Machine capacity up to 48 ounces. Straight commission basis, closed territory. Reply Box 3618, Modern Plastics.

MANUFACTURING SUPERINTENDENT: The East Coast plant of the largest injection molder in its field has a challenging opportunity for a manufacturing superintendent. Management functions include general supervision of all production activities including scheduling, production planning, machine maintenance and other related actvities. Profit sharing arrangement. Reply Box 3605, Modern Plastics.

PERSONNEL: Executive — Technical —Sales—Production. Employers and Applicants—whatever your requirements, choose the Leader in Personnel Placement. Cadillac Associates, Inc., Clem Easly—Consultant to Plastics Industry, 220 South State, Chicago 4, Ill.—WAbash 2-4800. Call, write or wire—in confidence.

EXECUTIVE OPPORTUNITY: New polyethylene compounding, processing and coloring plant. We need experienced executive, familiar with all technical aspects, to help setup and supervise complete processing, reprocessing, compounding and coloring operation. Compensation requirements will be arranged. Giving complete resume, reply Box 3604, Modern Plastics.

(*Continued on page 270*)

IMS PURE
SILICONE FLUID
MOLD RELEASE SPRAY

EXCLUSIVE, FAST, ALL-METAL VALVE ENDS FUMBLING SAVES CYCLE TIME

Keeps Mold Lube Cost Down

It Isn't Size — It's Performance and Quality That Count!

PRICES (Delivered)	
Sample Can	$2.00
Per Unbroken Dozen	$18.00
Per Unbroken Gross	$197.40

The Economical Way to Buy and Apply Pure, Costly Silicone Fluid!

To Cover All Molding Conditions Keep Both Types on Hand

IMS PURE
ZINC STEARATE
DRY POWDER SPRAY

HANDY MOLD DUSTER

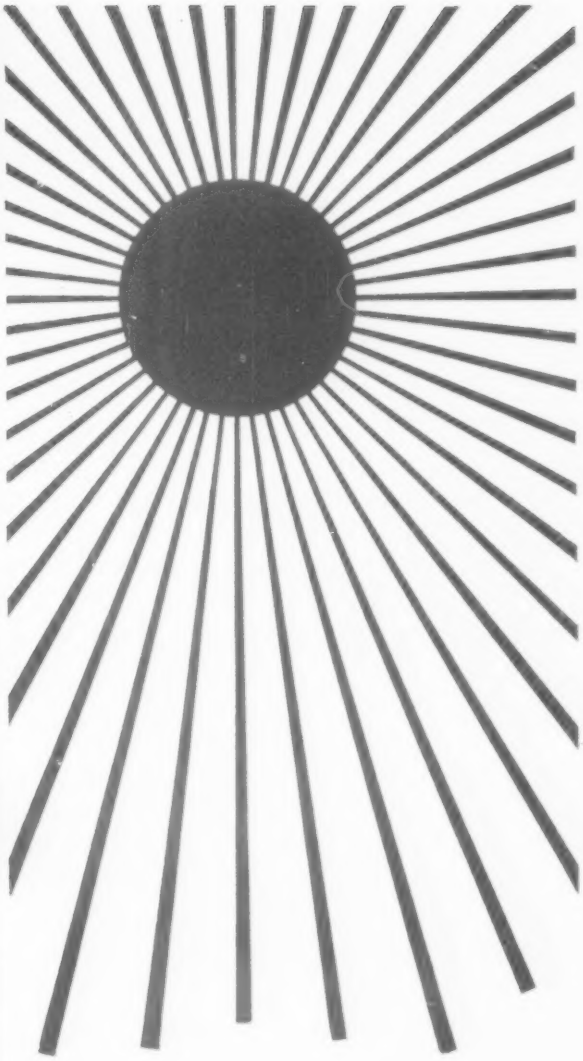
Quick—Convenient

Removable, Cleanable Spray Head Directs Dust Into Cavity Without Waste.

PRICES (FOB Cleveland)	
Sample Can	$2.00
Per Unbroken Dozen	$13.80
Per Unbroken Gross	$144.00

IMS Mold Releases are designed to bring you maximum quality and performance. Our Silicone Fluid Spray utilizes only more costly volatile Freon to minimize part marking on fast cycles. The Dry Powder Spray should be used in all applications where painting or plating follows the molding operation, also in preforming.

INJECTION MOLDERS SUPPLY CO.
3514 Lee Road, • Cleveland 20, Ohio



MERCURY-CADMIUM
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LITHOPONES - TONERS

SUPERIOR DISPERSION
EASY DRY-COLORING

WRITE FOR SAMPLES AND BULLETIN 29, COLOR CARD

Kentucky Color
AND CHEMICAL COMPANY, INC.

Louisville 12, Kentucky

(Continued from page 268)

PLASTICS ENGINEER: Experienced in mold design, mold cost, pricing parts and follow job through to customer acceptance. Company well-established, excellent reputation. Salary open. All information confidential. Give full resume. Reply Box 3603, Modern Plastics.

PLASTICS MACHINERY EXECUTIVE: Largest paper machinery manufacturer in the United States desires engineer with strong background in plastics machinery. Must have supplier and customer contacts and be capable of setting up a plastics machinery division and direct a sales and development program. This is a special situation for a man with the proper qualifications to step in as number 1 man in a new division of a long established, successful company. Salary open. Reply Box 350, Beloit, Wisconsin.

INJECTION MOLDING SUPERINTENDENT: Needed by expanding company in Midwest area. Must be familiar with all thermoplastic materials. Also require Decorating Superintendent familiar with painting and plating operations. Salaries commensurate with experience. Reply Box 3601, Modern Plastics.

CHEMICAL ENGINEER: Experienced in vinyl organosol coating, laminating and knit back stretch leather. Position available for product development and research with coating plant with strong financial resources available for expansion. State all facts, experience, references, age and salary expected. Crawford Manufacturing Co., Richmond, Virginia.

Situations wanted

POLYESTER: Technical man, 30, single, with good laboratory background and plant experience in polyester, desires supervisory or technical position in the reinforced plastic industry. Reply Box 3609, Modern Plastics.

PRODUCTION CONTROL MANAGER: Managerial and technical know-how in extrusion, thermoforming, materials compounding. Production control, product development, plant administration. Sales emphasis for your product coupled with technical know-how based on 15 years of thermoplastic experience. College graduate. Married. Age 35. Reply Box 3608, Modern Plastics.

SENIOR APPLICATIONS ENGINEER: In charge of fluorocarbon extrusion development for wire, tubing, film and rod for nationally known company. Also experienced in pilot laboratory and production extrusion of polyethylene film by both flat and blown tubing methods, acetate film, and sheeting. Do technical service in field and write development reports for field dissemination. Reply Box 3614, Modern Plastics.

REINFORCED PLASTICS MANAGER: Broad experience in new fiberglass product development and production. Have successfully set-up and administered complete divisions. Emphasis on large structures, building panels and missiles. An extremely cost conscious and highly respected manager who can assume full responsibility. Seeking company with promising growth potential. B.Ch.E. Age-37. $14,000 caliber. Reply Box 3617, Modern Plastics.

Miscellaneous

FOR SALE—BUTTON FACTORY: (Compression) with full line of staple & fancy molds, presses, preform machines, boilers, etc.—good condition. Reply Box 3610, Modern Plastics.

BUSINESS FOR SALE: Successful plastic houseware merchandise business for sale. Ideal for injection molder with large equipment. Reply Box 3612, Modern Plastics.

OPPORTUNITY: Are you an expert in your field? Do you want to buy your boss' business? A retiring business executive is willing to buy a going business or finance a promising development and put you in charge of your own future. All replies will be treated as confidential. Reply Box 3613, Modern Plastics.

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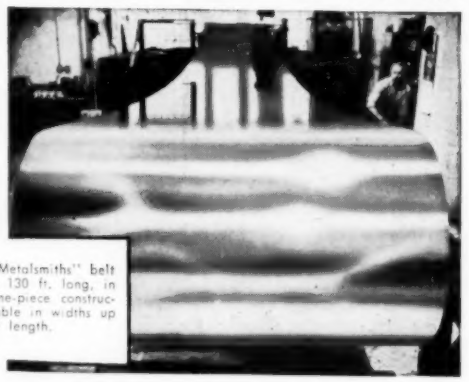

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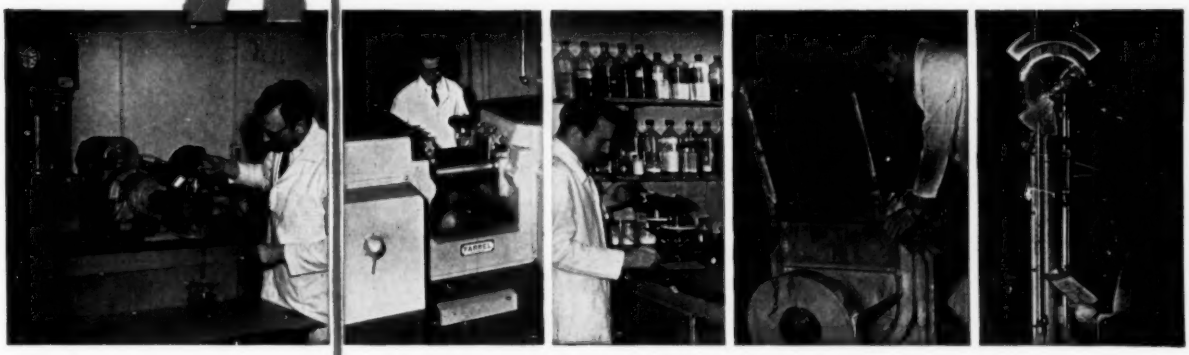

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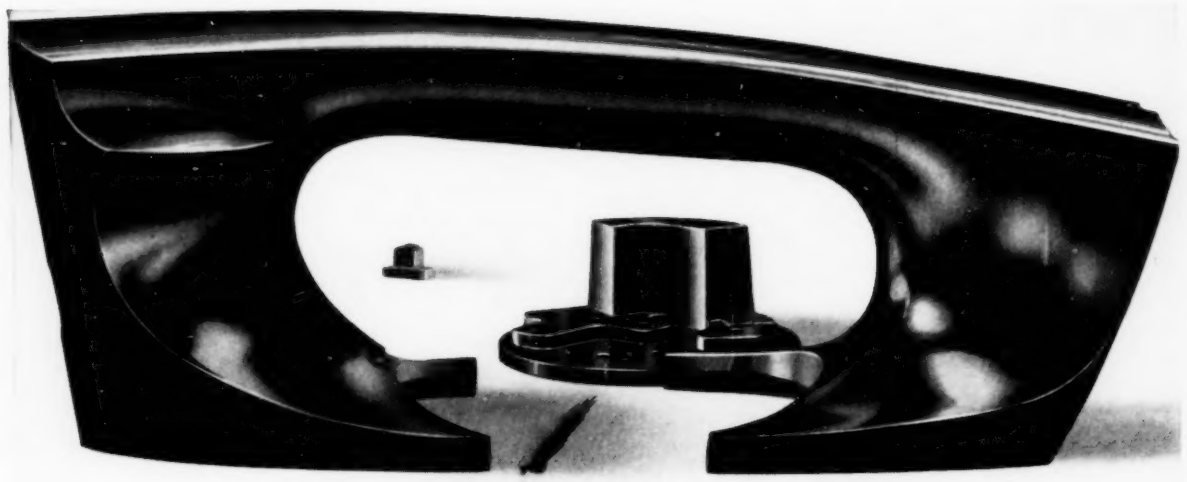

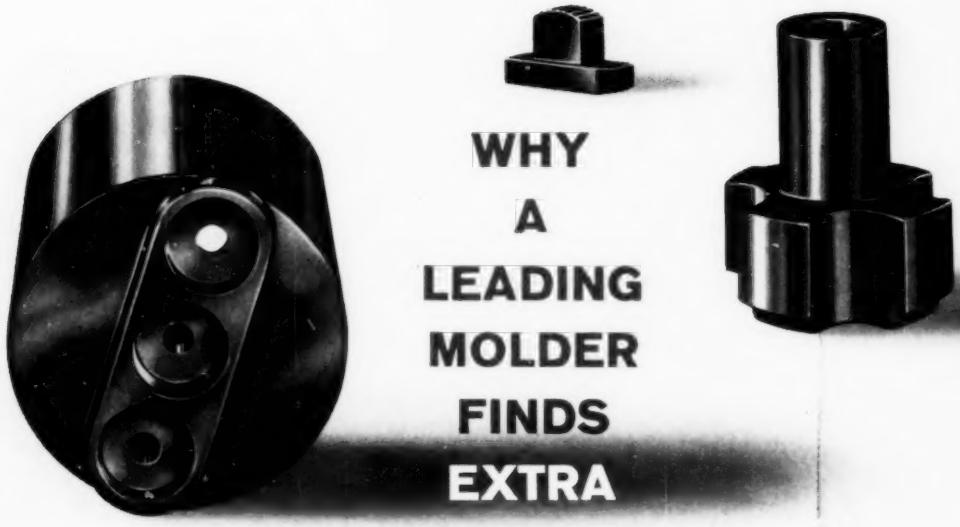

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